THE ARCHITECT & BUILDING NEWS

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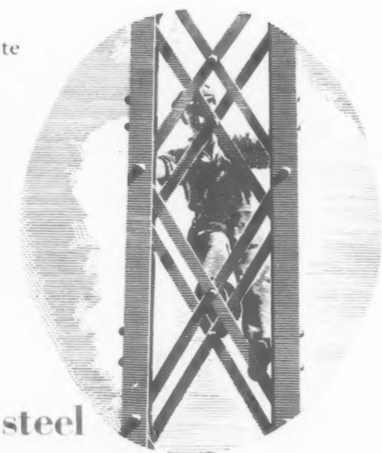
- NEWS OF THE BUILDING INDUSTRY

MARCH 30, 1951 · VOL. 199 · NO. 4293 · ONE SHILLING WEEKLY

A job done with zest

What this young woman is up to we are not quite sure, but she's getting on with the job and obviously enjoying it; that smile comes from following her creative urge.

All jobs well done are done with zest, whether it is lacing up a doll's shoe or the erection of a mighty steel structure.



Banister, Walton build in steel

LONDON, S.W.1 — 82 Victoria Street **MANCHESTER 17** — Trafford Park **BIRMINGHAM 18** — 61-63 Western Road

The 'CP' RANGE OF SPACE HEATERS FOR ALL REQUIREMENTS

CERTIFIED PERFORMANCE

10 CU. FT. PER HOUR

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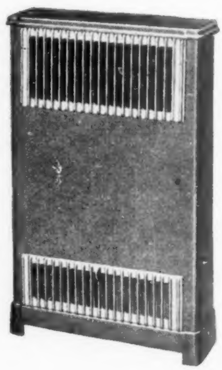
CONVECTOR TYPE 'B

Rating 10 cu. ft. (C.V. 500) 5,000 B. Th. U. per hour. Amber glass panel at base. For Shops, Offices and the Home. Bronze or Copper finish.

Town Gas only.



THE 'CP' WINDSOR

Rating 20 cu. ft. (C.V. 500) 10,000 B. Th. U. per hour. Fine design and high efficiency are incorporated in this heating unit, whilst its sturdy construction ensures long service.

Town Gas only.

FACTORY RADIATOR

Minimum rating 30 cu. ft. (C.V. 500) 15,000 B. Th. U. per hour. For Factories, Workshops, etc. Bronze finish.

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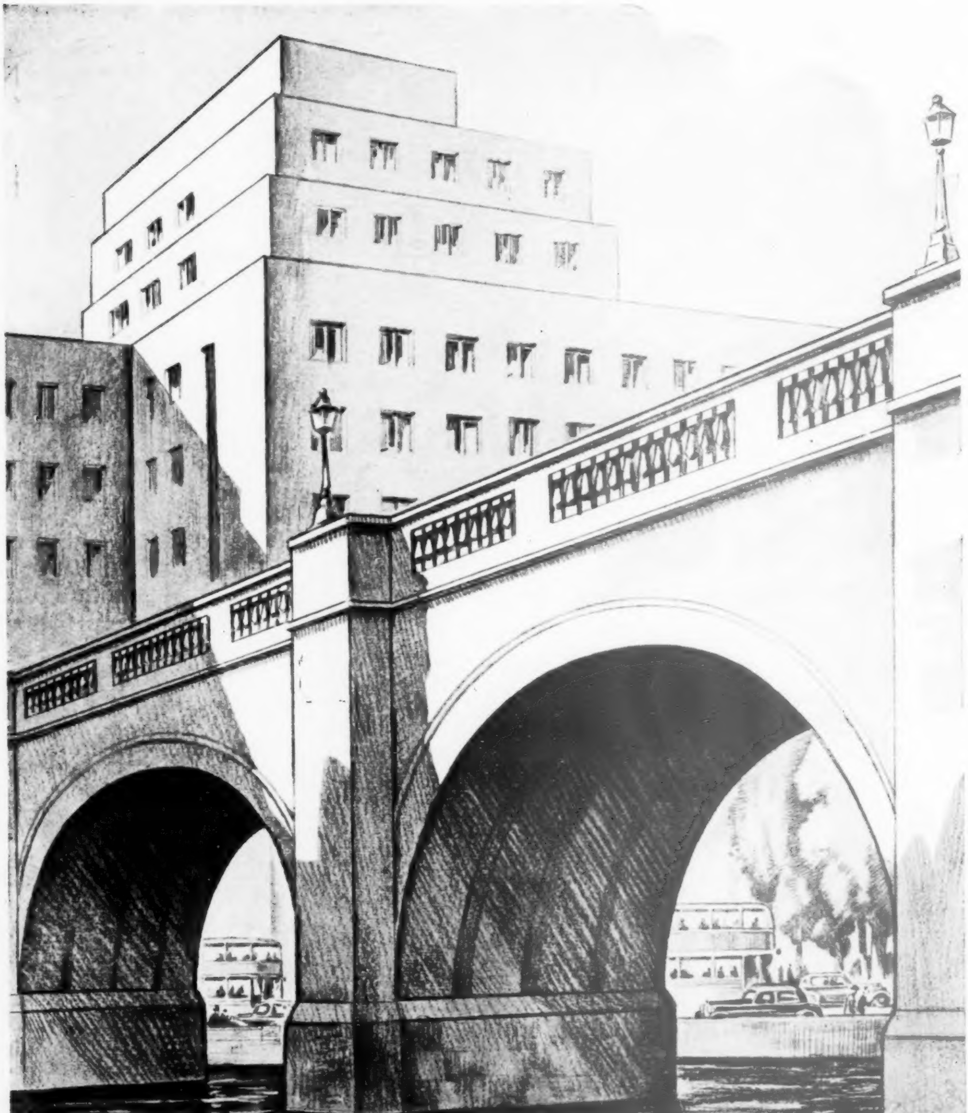
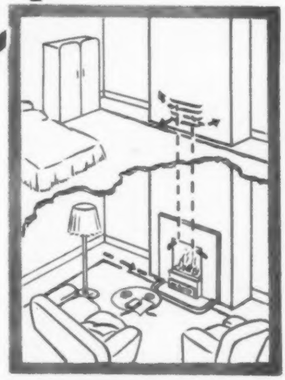
COWPER PENFOLD & CO. LIMITED

IMPERIAL COURT, 6 BASIL STREET, KNIGHTSBRIDGE, S.W.3

Telephones KENsington 3677, 3678 & 3679

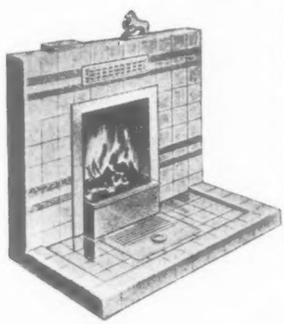


The Modern Way of HEATING



"Convection Heat"—which really means warmed air—is the *modern, economical,* and *satisfactory* way of making the most of Solid Fuel and getting the best from the appliances. Briefly, clean air is heated round the back and sides of the fire and the now warmed air is then carried along suitable ducts or pipes to a grille in adjoining or upstairs rooms. If desired, the warm air can be directed into the room in which the fire is installed to provide *extra* heat.

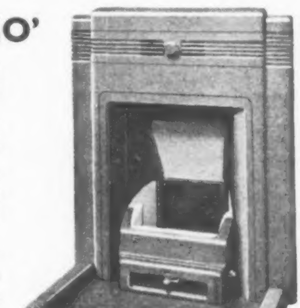
THE 'CAMELON' CONVECTOR FIRE



Two types of the Camelon Convector are available. The Upper and Over Floor Models. Both give excellent radiant heat, and distribute convection heat in much the same way as the Sofono Convector and are designed to burn continuously at a chosen rate on most types of solid fuel. Smoke emission is reduced by over 50% and in the use of the underfloor model, room draughts are considerably reduced. An optional H.P. boiler provides up to 9 gallons per hour domestic purpose. A patent closure lid ensures all-night burning. Both are suitable for 16 in. tile surrounds with 22 in.-26 in. high fire openings or with cast iron mantel and hearth or cast iron interior frame.

Vitrous enamelled in wide variety of colours. 12 pp. booklet, Building Instructions Leaflet and price list on request.

THE 'SOFONO' CONVECTOR FIRE



The Sofono Convector Fire is similar in appearance to the traditional type open fire. It is a continuous-burning, self-setting unit with the convector chamber formed by a cast iron jacket round the back, top and sides of the fire. The overall efficiency of this appliance is more than twice that obtained by a normal open fire. This efficiency is increased to 55%-60% when a back boiler is fitted.

The fire is prepared for either a prefabricated tile surround, a cast iron surround or a hook-on C.I. Interior Frame to suit loose tiles slabbed on site. Finished in many popular shades of bright easily-cleaned lustrous or vitreous enamels.

Complete details, diagrams and prices on request.

FEDERATED FOUNDRIES LIMITED

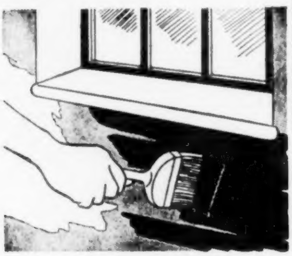
THE CAMELON IRON CO., LTD., FALKIRK

GRANGEMOUTH IRON CO., LTD., FALKIRK


WW 1760
6-6-½ 300
500
20¾ 2,000
5-9⅜ 800
WILLCOCK

The waterproof skin  *you brush on*

to prevent or cure damp walls . . .

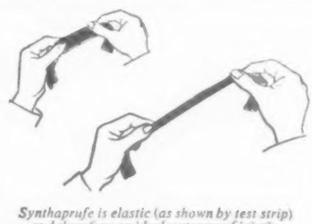


to seal concrete roofs . . .

to waterproof concrete sub-floors

SYNTHAPRUFE

forms an elastic, adhesive, waterproof coat **containing rubber**



Synthaprufe is elastic (as shown by test strip) and therefore an ideal waterproof jointing

SYNTHAPRUFE is a ready-to-use waterproofing compound which is applied *cold* by brush. Containing rubber, it is strongly adhesive, and sets rapidly to form a flexible, elastic film which is impervious to moisture.

It can be applied over concrete, plaster, brick, metal, or timber surfaces, and is satisfactorily used both in new construction and on existing buildings.

It makes an ideal waterproof "sandwich" layer in concrete sub-floors or roofs; and when used under granolithic or Terrazzo surfaces, it reduces the risk of cracking because its elasticity enables it to absorb slight movements in the base.

Synthaprufe is highly effective as a vertical damp-course on either external or internal surfaces, and is most valuable for treating damp in existing walls. Applied to outer surfaces, it can be rendered with cement mortar; applied to inside walls, it may be plastered if desired, or finished in distemper or wallpaper. Being strongly adhesive, Synthaprufe is also a perfect waterproof fixative for linoleum, wood blocks, and other floor or wall coverings.

In short, Synthaprufe offers the architect, builder, and engineer a waterproofing and jointing material of unusual efficiency and versatility, ready to use and easily applied.

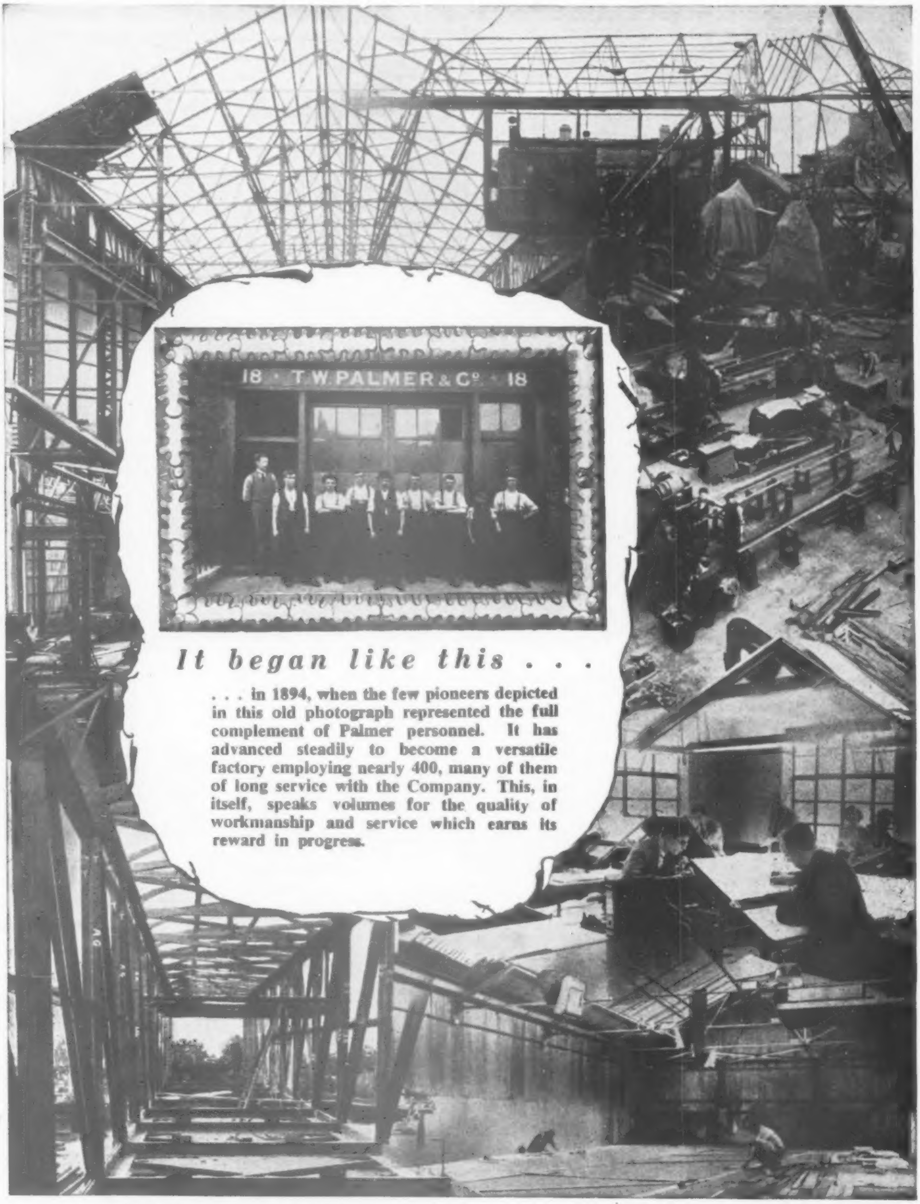
SOME SPECIAL USES

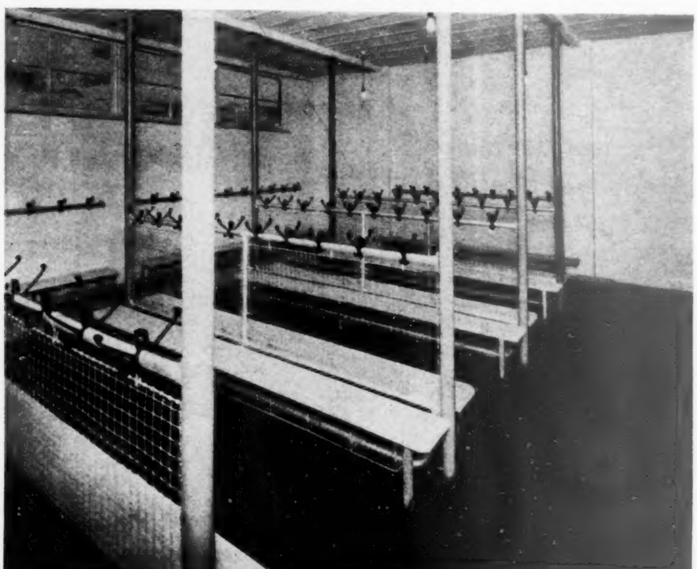
- **Sealing concrete structures above and below ground level — swimming-baths, reservoirs, cooling-towers, etc.**
- **Protecting concrete piles, steelwork, sewer-pipes and joints, etc.**
- **Waterproofing asphalt, lead, zinc, corrugated iron, or felted roofs.**

SYNTHAPRUFE CONTAINING RUBBER

Manufactured by the NCB ***National Coal Board***

Synthaprufe is a product of British Coal. Further details, and advice on any technical problem, will gladly be given on application to the National Coal Board, By-Products, N.P. Bank Buildings, Docks, Cardiff


18 T.W. PALMER & Cº 18
It began like this . . .
. . . in 1894, when the few pioneers depicted in this old photograph represented the full complement of Palmer personnel. It has advanced steadily to become a versatile factory employing nearly 400, many of them of long service with the Company. This, in itself, speaks volumes for the quality of workmanship and service which earns its reward in progress.



Cloakroom scheme fastened to existing Stanchions

Vol. 199. No. 4293.

THE
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& BUILDING NEWS

March 30, 1951.

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ARCHITECTURE ON PAPER

ARCHITECTURAL draughtsmanship is a means to an end. For generations, even centuries, this has been the tenet of the architect; students have been and are taught that it is so. It remains, therefore, as one of the crafts that ultimately lead, by synthesis and collaboration to the end of building—to architecture—with all it implies by way of science and art.

Yet the architect that is a draughtsman—an architectural draughtsman—has a certain feeling that his type of drawing is not only a mere means to his end. Like painting and etching it can be an art-form in itself. Although, certainly, not all architects are good draughtsmen — Wren was not — most would maintain that architectural draughtsmanship should be regarded as an asset for their work and as one of the minor arts. It has been so regarded in this country and in Italy and in France, because of the long traditions of topographical delineation. It has, perhaps, been assisted to a status of its own, in this country more particularly, by the extension and enlargement of English topographical work of the 18th century into the unique school of water-colour landscape painters of the 19th century, which in itself is a recent but major contribution to the history of art in Europe.

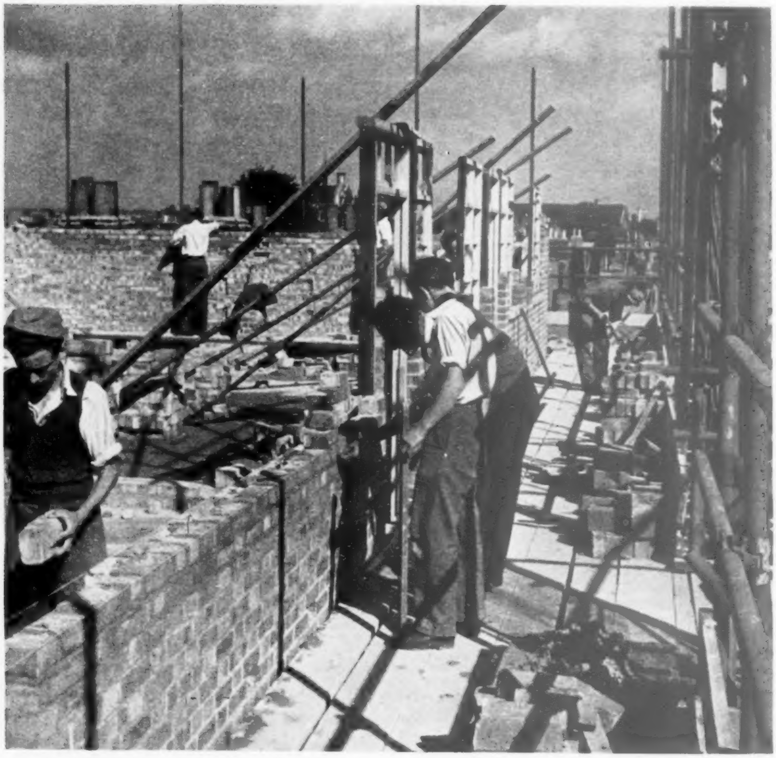
There are great traditional possessions in the realm of architectural draughtsmanship, about which, in spite of the efforts of our national collections and of the R.I.B.A. Library in particular, all too little is known by the average qualified architect and still less by the average student of today.

Is the art of architectural draughtsmanship suffering an eclipse before it emerges into a new period of brilliance or will it continue on the down-grade? The hard training of the past, when the qualities of solidity and of three-dimensional appreciation were not the only disciplines that were imposed, seems to have given way to a period of thin watery expressions. Quality, a primary tribute of any art, has been lost and very little has been found to replace the older and, perhaps now somewhat unsuitable, methods of the past. The art of "finish", even fine lettering, tends to disappear from architects' drawings. It appears likewise to be out of fashion with the schools and with their students; even the "show" drawings entered for the national prizes maintain emasculated techniques that have become all too fashionable as a paper expression of modern thought about architecture. The delineation of unbuilt architecture on the two-dimensional plane is looked upon as something of a bore, about which there is no conviction or enthusiasm and even as a means to an end is now somewhat suspect.

What are the explanations of the decline? The camera and modern reproduction processes may take some of the blame. There is certainly much less sketching and measuring done as a study than there was, even thirty years ago; adventure and experiment in drawing and painting, as an architectural recreation, has largely given way to the products of the miniature camera and to photographically illustrated books and periodicals.

Present-day materials may receive a little blame also; pencils are not quite of the quality that was known before the war, the "lead" and even the wood that surrounds it do not enthuse the draughtsman who has memories. And as for the bottled ink called "indian", why is it that this country does not and, in fact never has, produced ink like that still made in the U.S.A.? Paper is notoriously scarce; the higher grades of fine paper, in roll or hand-made in sheets, are still exceedingly rare and many sorts are, again, mere memories. Tracing paper (there are now some modern substitutes) has improved, but not "detail" paper.

These, alas! may be some of the things that irritate and, perhaps, to them can be ascribed some of the changes and, as we think, deteriorations that are discernible in the art of architectural draughtsmanship. But we cannot help feeling that there may be some loss to architecture as well, for there will always be a strong alliance between architecture and drawing, and one affects the other.



Apprentices at work on permanent housing for the Borough of Camberwell under the Apprentice Master Scheme. See pages 361-367

EVENTS AND COMMENTS

ARCHITECTURAL TRAINING IN TURKEY

I SAW last week a selection of drawings by students in the first three years of the five-year course at the Technical University School of Architecture in Istanbul. The standard of draughtsmanship was high and the drawings had a quality which is lacking in the work of many British schools. The designs were for the most part traditional and this is scarcely surprising in a country where only local materials such as stone and timber are readily available. All steel must be imported into Turkey and, since it is a comparatively poor country, design for modern materials tends to be a mere flight of fancy.

Most of the drawings which I saw were produced with the same technique, based, I guess, on a mixture of Scandinavian and Swiss practice. The process being to draw, in the faintest pencil, on rough paper, and then to ink in free-hand with infinite care and detail. Many of the small country buildings were charming and the larger schemes for public buildings, though somewhat unimaginative in plan, showed a good appreciation of classic proportion. Owing to a misunderstanding, examples of the work of the fourth and fifth years' work were not sent.

The close similarity between the designs may be due to the system of instruction followed at the school. If I understand correctly, the student prepares sketches of a number of ways of solving the problem in hand. These are submitted to the professor, who chooses the scheme to be completed. I do not think that this system, which doubtless has its points, would be well received in some of our schools.

REBUILDING WARSAW

THE Polish Ambassador last week opened an exhibition at the galleries of the R.W.S. describing the rebuilding of Warsaw. There are some fine photographs of men at work but very few of good architecture. The

task was vast, but it is difficult to appreciate from the exhibition just how much has been done, although I noted that a number of undistinguished buildings had been exactly rebuilt. The pictures which are hung on an ingenious space frame device are interspersed with panels of pompous praise of the Russian Army and exhortations to this and that.

FIRE PREVENTION

THE Rootes Group, in their showrooms in Piccadilly, have a small but lively exhibition on fire prevention in the home, organised by the Home Office and the C.o.I.D. An old steam horse-drawn fire engine steals the show, as well it might, since it bears a plate detailing the number of prizes which its type earned all over the world including, rather surprisingly, in India. Wireless equipment without which no well-dressed modern fireman would dream of leaving his station, is also on view. A series of display panels and " peppers ghosts " shows the fire hazards in the ordinary home. The numbers of fires caused by these hazards are recorded in large and frightening figures. Of special interest to children and others is a demonstration of what happens when you dial 999 and ask for the fire brigade.

SHAW'S CORNER

WHEN G.B.S. left his house at Ayot St. Lawrence to the National Trust, he did so apparently without endowing it. An appeal is to be made for funds for its upkeep. Shaw's very considerable fortune, after various legacies and annuities have been paid, is, it seems, to be devoted to developing his patent alphabet. This is rather hard on the National Trust, or is it just a parting shot of Shavian wit?

IRISH ARCHITECT FOR FRENCH THEATRE

ACCORDING to an Agency report, Mr. Michael Scott, the Dublin architect, is in France, where he is acting as consultant for a new theatre which is to be built in a provincial town. I hope that Mr. Scott will have better luck with the theatre than he has had with his Dublin bus station, which is being converted into offices for a Government department.

THE SUPPLEMENTARY RESERVE

THE temper of this country is such that as long as the United Nations forces are going the right way in Korea, foreign affairs tend to take second place to the meat shortage, the climax of the football season and the early disaster to the Oxford boat. The fact remains that we are still in a most awkward spot and building up our forces as hard as we can go. The Adjutant-General, General Sir John Crocker, has asked in a letter on another page that the reconstitution of the Supplementary Reserve shall be drawn to the atttention of all employers. The War Office has at the same time issued a neat leaflet on the S.R., setting out all the facts and figures. The appeal is particularly made to specialists.

THE RURAL DEAN'S VISITATION

THIS is the title of a leaflet issued by the Central Council for the Care of Churches, and refers to the regular periodic inspection of churches by Rural Deans. The leaflet, which was obviously written by a most experienced tracer of dry rot and beetles, is a model of its kind. I imagine that it will strike terror into the hearts of all but the stoutest Rural Deans. Furnishings as well as structure must be examined, old and moth-eaten cushions must be thrown away"; " more sanctity attaches to austerity than to dirt," says the writer. Picture the Rural Dean, with his notebook and pencil, his Rural Deanery Book, and his field glasses, prodding the drain of the font with his " long light cane."

The leaflet is a mixture of a surveyor's guide and a commanding officer's inspection crib and should be a great help to anyone engaged on the inspection of old buildings.

" DOMUS "

THE current issue of this luxurious Italian paper is somehow not up to standard. For one thing a section is printed on coloured cardboard. The production

" . . . and it only cost £999 to build."

Mr. H. Wilson Parker at work on his plaque which the Council of Architecture is to award for good building and landscaping to mark the Festival year.

lacks the crispness which made the paper so remarkable until recently. *Domus* is tending to become more and more of an international paper, perhaps because the first rush of new Italian work which began after the war is now over. It is still a good paper and perhaps the loss of quality is only temporary. Let us hope so, for in this country, at any rate, the subscription is very high.

EASTER HOLIDAY

AS a family we are unenterprising at the public holidays, fearing crowds, staying in bed late, and so on. The needs of the garden have also to be considered, although personally I seldom get far beyond this stage. Fortunately week-end guests from the big city often express a wish to do something useful and can be found jobs which do not need too much supervision. A kind friend from Stockholm on Saturday reduced an overgrown privet hedge from 10 feet to 3 feet in height, with the result that the view is strangely changed.

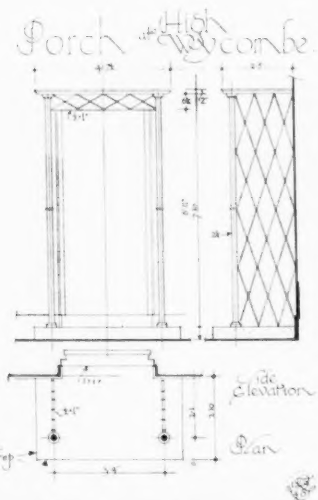
We did manage to rouse ourselves to go out on Sunday, and drove down to the New Forest on a visit. Scorning the various by-passes, we went through all the towns and found them neat, deserted and highly architectural in the bright sun. A surprisingly large number of buildings seemed recently to have been painted (Up the F.o.B.!) Among the curiosities we saw were a tandem tricycle, ladies' pattern, and a shop with the names Pink and Stretch over the door. It was also an ironmonger's and not a corsetière's.

My daughter, aged eight, announces that, as their contribution to the F.o.B., her dolls have spring-cleaned their house and entirely rearranged its interior.

ABNER

THE LATE FRANK ROSCOE

An Appreciation



For a number of years between the wars Frank Roscoe's measured drawings were a feature of the A. & B.N. The illustration shows the quality of his draughtsmanship.

FRANK ROSCOE was educated at Berkhamsted School and received his architectural training at the Architectural Association School. He was elected an Associate of the Royal Institute of British Architects in 1926 *and worked in various offices, including that of Mr. Vincent Harris, R.A., for whom he also acted as Clerk of Works at Braintree Town Hall, until* 1929, *when he joined the teaching staff of the Northern Polytechnic School of Architecture. He continued to teach in this School, becoming one of its Senior Lecturers, and to practice his profession for the remainder of his life. He was unmarried. He died at the age of forty-nine on the* 10*th of March,* 1951.

Possessed of wide artistic interests and attainment, Frank Roscoe was an accomplished water colourist, a writer on many topics, a connoisseur and collector of English furniture and ceramics, and an amateur musician, as well as architect and teacher. To this many-sided ability he added enthusiasm and a tenacity of purpose, together sufficient to ensure distinction in any work he undertook.

That he should turn to teaching was not surprising, for he was the son of a prominent educationist, a fact which may also account for his approach to this work, which was always that of the professional and never that of the amateur. Gifted as he was, therefore, it was not surprising that he exercised great influence in the school in which he chose to work, and that his contribution to its development was one of outstanding worth.

His interest in teaching limited his practice, but he found time to execute schemes of decoration and to design a number of houses, all of which bear witness to his sense of fine quality in material and craftsmanship, while reflecting his admiration for those smaller buildings of the eighteenth century which he studied closely throughout his career.

His death deprives the profession of a teacher of outstanding ability and those who were nearer to him of a vivid and generous personality in which earnestness and whimsical humour were blended in delightful harmony. It will be felt as a personal loss by his colleagues and the many students who held him in affection.

F. E. G.

NEWS OF THE WEEK

Buckinghamshire Society of Architects

Measured Drawings Prize—Summer Sketch Club

All students resident in Buckinghamshire, or working in the office of a member of the Society who practices in the county, are invited to submit work for the Summer Sketch Club.

Prizes of books will be awarded in two classes:

Sketching

A series of three sketches of architectural subjects, carried out in any medium.

Measured Drawings Prize

A set of measured drawings of any suitable building in the county, preferably an eighteenth century domestic building.

There should be a minimum of three sheets of drawings, comprising:

(1) ⅛ in. scale elevations and sections, and sufficient of the plans of each floor to show the façade.

(2) ½ in. scale or 1 in. scale details of one of the main feautres of the elevations, with sufficient plans and sections to explain the elevation.

(3) Full-size details of the feature shown in Sheet 2.

Instructions To Competitors

(1) Competitors are to notify the Honorary Secretary of the Bucks Society of Architects, W. Leslie Jones, 21 High Street, Great Missenden, Bucks, not later than May 26, 1951, of their intention to compete. Finished work is to be delivered to the Hon. Secretary not later than noon on September 18, 1951.

(2) Work is to be submitted anonymously, with a motto chosen by the competitor marked on the drawings. The work is to be accompanied by a sealed plain envelope bearing the competitor's motto only on the outside, and containing his name and address, name of architect by whom he is employed or the school at which he attends.

(3) *Original notes and plottings are to be submitted with the finished work.*

(4) *Selection of building.* The character of the building selected for study will be considered in making the award. In the event of any difficulty in selecting a suitable building, or obtaining permission to make drawings, the Society will be pleased to offer advice and help, through the Secretary.

North Staffordshire Students' Competition

The design of the entrance gateway to the new College of Further Education, Stoke-on-Trent, has been thrown open to competition to students of the North Staffordshire Technical College and the Stoke City Schools of Art.

The new gateway is to be a memorial to the Festival of Britain, and will be linked up with the town's Festival celebrations as the contribution from the Building Department of the Technical College. All building materials are being supplied free by members of the North Staffordshire Council for the Building Industry, and the students themselves will carry out the work of building from the winning design.

Two monetary prizes have been offered to the winner of the competition; £5 5s. awarded by the North Staffordshire Joint Council for the Building Industry, and £3 3s. by the Governors of the College. A further prize of £2 2s. is offered by the Governors for the best design for a crest, to be incorporated in the gateway.

The assessors are: Mr. H. Dibden, M.A., B.Sc., Chief Education Officer for Staffordshire; Mr. J. R. Piggott, F.R.I.B.A., City Architect, Stoke-on-Trent; Alderman G. L. Greaves, A.R.I.B.A.; Mr. R. J. Willis, M.A., F.R.I.B.A., President of the North Staffs Architectural Association; Mr. W. Leake, Chairman of the College Building Advisory Council and President of the North Staffs Council for the Building Industry; Mr. R. H. Marlow, A.R.C.A., Principal, City Schools of Art; Mr. J. A. Pickavance, F.R.I.B.A.

The Building Department of the North Staffs Technical College commenced approximately four years ago. To-day it has grown, so that it has 1,650 students attending. Many of the students will be accommodated in the new College for Further Education.

OBITUARY

The death has occurred, on March 23, of Mr. W. L. Duncan, F.R.I.B.A., F.R.I.A.S., at Turriff, Aberdeenshire, at the age of 80. Mr. Duncan was senior partner in the firm of Duncan & Munro and an ex-president of the Aberdeen Society of Architects.

COMING EVENTS

Royal Institute of British Architects
- April 3, at 6 p.m. Presentation of Royal Gold Medal.

Town Planning Institute
- April 5, at 6 p.m. "Planning as the Instrument of Policy." Speaker: Sir George Pepler.

Institute of Registered Architects
- April 6, at 6.30 p.m. Open Forum. "Architecture and the Architect from the Layman's Point of View" at the Royal Society of Arts.

The Tea Centre, 22 Regent Street.
- "Hospitality at Home," an exhibition of Contemporary furniture and fittings arranged by the C.o.I.D. in conjunction with the Tea Bureau, March 29—May 12.

CORRECTION

Planning the Library, published by Roneo Ltd., 17 Southampton Row, W.C., is 10s. 6d., and not free as stated on p. 348 of last week's issue.

APPOINTMENT

Mr. Keith Pegden Smith, A.R.I.B.A., of Slough, Buckinghamshire, has been appointed to be an architect in the Public Works Department, Nigeria.

Mr. Smith was trained at the Ramsgate Technical Institute, and the Regent Street, Polytechnic, and has held appointments at the Broadstairs and St. Peter's U.D.C., and as an assistant architect to the Borough of Slough, and later, to the Borough of Ealing.

CORRESPONDENCE

Modular Co-ordination

To the Editor of A. & B.N.

Sir,—As a Building Contractor who has spent his life in reconstruction and rebuilding in "built-up" areas, my automatic reaction to the first report of the Committee is to wonder how the adoption of this theory would work out where the dimensions of the structure have to fit in with the fixed measurements of existing buildings or sites.

One can see the merit of an agreed module for new construction on free sites, where dimensions are not tied tightly by adjoining buildings or awkward shapes sites so valuable that every inch has to be used to best advantage—but in large towns, alas, the latter conditions are those prevailing and one wonders how the module can be used advantageously in such circumstances.

Long usage, has however, given all building craftsmen the basis of a module in the brick size, the controlling factor for all trades appearing to be a multiple of 9″ × 4½″ × 3″, and it would seem to a builder that any module used in new and existing construction should, of necessity, be a multiple of nine inches, and any vertical module, one that is divisible by three, to line up with brick courses. If modules are to be a successful addition to the techniques of Building, the interest and advice of the men on the job will have to be secured, as well as that of the professions, and in this connection, it is rather a shock to realise the absence from the list of Committee members of any representative of Foremen, Clerks of Works or craftsmen.

I am, etc.,

A. W. YEOMANS
M.I.O.B., F.I.D.

The External Student

To the Editor of A. & B.N.

Sir, — Your correspondent "Per Ardua" has raised a very important matter and carries on the good work started by Mr. Maurice E. Taylor in taking up the cause of the external student at examinations.

Twice yearly at the R.I.B.A. oral examinations there are many students who have to answer the examiner's opening gambit by telling him the school they attended. If the answer is that of some "unrecognised" art or technical college or a correspondence school, as very often happens owing to the geographical position of the candidate's office and home, the reply made

is often in the nature of a snort plus "Go to a proper school and don't waste your time!" Hardly words of encouragement but ones which will give the student an inferiority complex handicapping his replies to other questions.

The absurdity is that the R.I.B.A. and, in all probability, the Secretary to the Board of Architectural Education has advised the student to go to that particular school but the Examiners, all school trained and examined and mostly teaching in those self-same schools, seem unaware of this fact.

As for the two or three word remarks on rejected testimonies of study . . . "unsympathetic treatment of subject" . . . "a jerry builder's effort" . . . "no idea of design; do it again" . . . etc., etc. I hasten to add that I agree with everything said but how intolerably little was said to *help* the student.

Regretfully, I too must perforce sign myself anonymously.

I am, etc.,
"TUTOR."

Sir Edwin Lutyens

To the Editor A. & B.N.

Sir,—Whilst not wishing to belittle the very real contribution made by Sir Edwin Lutyens to the cause of architecture, I feel that the statement of Mr. Geddes Hyslop in his review in the February 9 issue of your journal of the two recent works on Lutyens "one can say honestly that every building by Lutyens has improved with age" is in need of revision.

I spent a very delightful week-end at Little Thakeham, and enjoyed a beautiful chamber concert in the music room, but I could not help wondering at what cost to my host this joy had been made possible, for almost all the stonework, including transomes, mullion, chimney stacks cappings and the stone pergola had been renewed or were in the process of substantial "restoration."

Lutyens was warned of the unsuitability of the local stone for building purposes but he chose to ignore the advice. I cannot speak from experience of other examples, but I understand that Little Thakeham is not alone in showing signs of dilapidation, and I think it must be admitted that a knowledge of building materials cannot be counted among the more conspicuous gifts of one of England's wittiest architects.

I am, etc.,
K. DOUGLAS BUNDY.

The Supplementary Reserve

To the Editor A. & B.N.

Sir,—You will no doubt have seen mentions in recent months, both in Parliament and in the Press, of the Supplementary Reserve for the Army.

The object of the Supplementary Reserve, is broadly, to provide the technical and administrative units needed to form the essential backing to the fighting formations of the Regular Army and the Territorial Army immediately on mobilisation. The Supplementary Reserve is not part of the Territorial Army but an essential complement to it. In structure its units are similar to those of the Territorial Army, in that they consist of basic elements of volunteers to provide the senior officers and N.C.O.'s, completed ultimately with National Service men during their part-time service. But the units are raised essentially on a trade or "skill" basis and not territorially.

Because members of the Supplementary Reserve will normally be technicians whose military employment will be almost identical with their civilian occupations, and also because of the difference in organisation compared with the Territorial Army, there is no liability for evening drills or week-end training. The normal training liability is an annual 15-day camp, and in certain cases military training in peace time is not needed at all.

You will wish to know the position about reserved occupations. The principles and procedure for these will be identical with those devised for the Territorial Army, which have recently been accepted on behalf of both sides of Industry by the Minister of Labour's National Joint Advisory Council. We only enlist volunteers into the Supplementary Reserve provided that they have been cleared in this respect by the Minister of Labour.

I hope that this letter will give you a clear picture of the object and importance of the Supplementary Reserve and of the essential part which the volunteer element fulfils in this organisation.

I am, etc.,
JOHN CROCKER, General,
Adjutant General to the Forces.

IN PARLIAMENT

Bricks and Cement

Mr. Marples asked the Minister of Works how many bricks and how much cement he estimated would be needed to meet the requirements of the defence programme for the calendar years 1951, 1952 and 1953. **Mr. Stokes**: It is impossible to state with precision the requirements of the defence programme for bricks for three years ahead, in advance of the planning of the individual jobs. I have taken account, however, of defence needs in calling for an increase in the production of bricks to a yearly rate of 7.4 thousand million as soon as possible, and in asking the cement manufacturers to be prepared to deliver 2.2 million tons of cement to the home market in the present year. (Mar. 20).

More Softwood this Year

Colonel James Hutchison was informed by **Mr. Bottomley**, Secretary for Overseas Trade, that he expected our total 1951 imports from Canada of softwood, including those suitable for housing, very considerably to excede the pre-war average. (Mar. 20.)

Balanced Reconstruction

Brigadier Clarke asked the Minister of Local Government and Planning if he would grant additional building licences to bomb-damaged cities in order to speed up their building programmes and bring these cities in line with other cities that suffered no war damage. **Mr. Dalton** replied that in blitzed cities he must keep a balance between new housing and the rebuilding of banks, offices and shops in the central areas. When Brigadier Clarke recalled the statement of Mr. A. Bevan last November that he was willing to consider applications for additional private building licences in bomb-damaged cities, Mr. Dalton repeated that if any authority could show that it could do better than the allocation given he was always prepared to consider its application by putting it on to the authority's total and taking it away from those who could not do it. (Mar. 20.)

Mr. Alport asked the Minister of Local Government and Planning how many applications had been received from local authorities by his department to alter the existing ratio between houses built by the council and those built under private licence: and on how many occasions he had given his approval for this to be done. **Mr. Dalton**: 75, of which 5 have been approved. (Mar. 20.)

Four Years' Record

Mr. Stokes stated in reply to Mr. Bullus that in the four years 1947-1950 the Ministry of Works and local authorities investigated 19,489 cases of alleged contravention of Defence Regulation 56A (building regulations). Proceedings were instituted in 1,189 cases involving 1,528 private individuals, 507 private companies and two boards of nationalised industries. (Mar. 20.)

Ancient or Modern ?

Mr. Percy Wells asked the Minister of Works why Faversham town hall had been scheduled as an ancient monument. **Mr. Stokes** replied that Faversham Market Hall was an interesting early 18th century building, and the Ancient Monuments Board for England advised him that it was a monument the preservation of which was of national importance. Mr. Wells described it as a comparatively modern building, having been started in 1814. Mr. Stokes repeated that his information was that it was an 18th century building. (Mar. 20.)

(Continued on page 374)

BOROUGH OF CAMBERWELL PERMANENT HOUSING

architects:
JOHN GREY
& PARTNER

THE four small schemes illustrated here were built on bombed sites, which accounts for their irregular shapes. The neighbouring streets consist generally of typical small South London terrace houses. Rebuilding on cleared bomb sites presents special, and in some cases unforeseen problems. When handed over to the architect they often have a somewhat misleading and innocent appearance not altogether justified by further investigation. Unexpected factors such as deep craters which have been filled in and ruined basements may be responsible for heavy extra costs in fillings and foundation works unless special care is taken to make a thorough investigation in the initial stages. Trial holes are essential, and in many cases piling and ground beams have to be resorted to.

For purposes of density Camberwell is divided into two areas—north and south. The former has a permissible density of 40 dwellings to the acre, and the latter 20. These have been generally followed subject to the overriding principle that in crowded areas the number of new dwellings should in no case exceed those destroyed.

These schemes were limited to a height of 3 storeys, and consist either of flats, or maisonettes with flats over. The advantage of planning the large family units near the ground and putting the small flats above, the reverse of the normal procedure—is that the maisonettes can have their own private gardens for the use of the children, leaving the rest of the site common to the flat dwellers.

The Housing Committee made certain stipulations such as balcony approach, the provision of convector grates with back boilers, and utility rooms in maisonettes.

Two of the schemes illustrated here, i.e., Hawkslade Road-Athenlay Road and Alder Street-Cator Street, were erected under the Apprentice Master Scheme. There is no doubt that this scheme, when efficiently organised, can be made to work admirably and provide first class training for the boys. From the architect's point of view it has the merit of ensuring the careful and accurate interpretation of his design and a high standard of finish. The keenness of the boys and the rapidity with which they acquire skill in their various crafts should augur well for their future and for the future of the Building Trade, provided certain later difficulties can be overcome.

ALDER STREET-
CATOR STREET

Number of Dwellings—24.

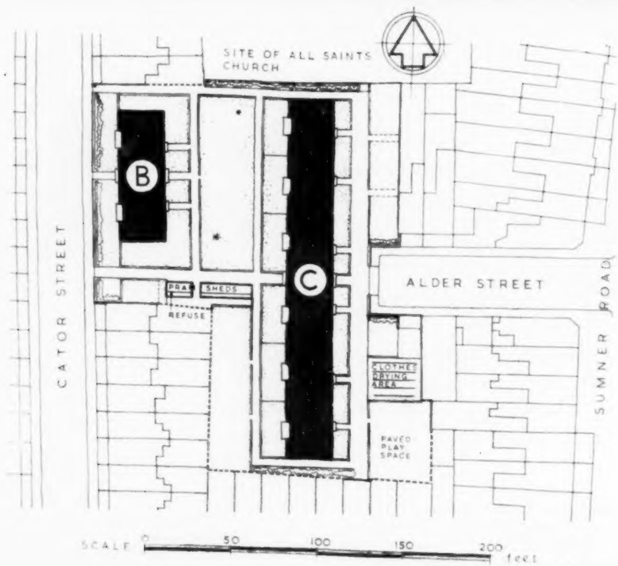
Accommodation—120 Persons.

Type—3 Storey Flats.

Construction—Load bearing brick walls and fireproof floors. Pitched roofs.

Contract Price—£43,947 11s. 2d.

Special Features — Wash boilers and sinks provided in Bathrooms, to avoid washing clothes in Dining-Kitchens. Planning of chimneys on spine walls with H.W. cylinders adjoining, to reduce length of supply to bath and sinks. Also to provide secondary heating to Dining-Kitchens. Extra deep cupboards in Bedrooms 1 and 2 for boxes, etc.



CONTRACTOR: RICHARD COSTAIN LTD., DOLPHIN SQUARE, S.W.1.

SUB-CONTRACTORS

Hollow Tile Floors: The Helical Bar & Engineering Co. Ltd.

Roof Tiling: Finnis Nicholls Ltd.

Electrical Installations: London Electricity Board.

Gas Installations: South Metropolitan Gas Company.

Sanitary Fittings: Broad & Company Ltd.

Metal Door Frames: The Morris Singer Company Ltd.

Flush Doors: Montague L. Meyer Ltd.

Wood Windows: Austins of East Ham Ltd.

Artificial Stone: Stuart's Granolithic Company Ltd.

Ironmongery: Adrian Stokes Ltd.

Finlock Gutters: Finlock Gutters Ltd.

Fireplace Surrounds and Back Boilers: Broad & Co. Ltd.

Floor Tiling: Horsley Smith & Co. (Hayes) Ltd.

Melbourne Grove, Lytcott Grove and Playfield Crescent Scheme

PHILIP ROAD-MANATON ROAD

Number of Dwellings—16.

Accommodation—62 persons.

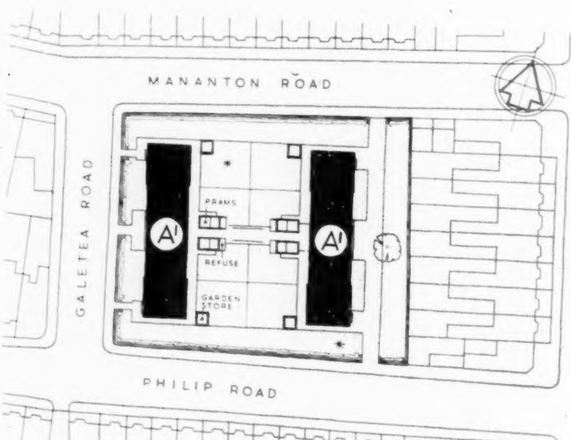
Type—Maisonettes with flats over.

Construction—Load bearing brick walls, fireproof floors and pitched roofs.

Contract Price—£22,592.

Special Features—Convection heating to Dining-Kitchens and two bedrooms on the first floor in maisonettes.

*



CONTRACTORS: MESSRS. LINE & COMPANY, 152 BARRY ROAD, EAST DULWICH, S.E.22.

SUB-CONTRACTORS

Hollow Tile Floors: Caxton Floors Ltd.

Roof Tiling: Finnis Nicholls Ltd.

Electrical Installations: County of London Electricity Supply Co.

Gas Installations: South Metropolitan Gas Company.

Sanitary Fittings: Broad & Company, Ltd.

Metal Door Frames: The Morris Singer Co. Ltd.

Flush Doors: Austins of East Ham Ltd.

Wood Windows: Austins of East Ham Ltd.

Artificial Stone: Stuart's Granolithic Co. Ltd.

Ironmongery: Comyn Ching & Co. (London) Ltd.

Finlock Gutters: Finlock Gutters Ltd.

Fireplace Surrounds and Back Boilers: Broad & Company Ltd.

Floor Tiling: Jaconello Ltd.

HAWKSLADE ROAD-
ATHENLAY ROAD

Number of Dwellings—20.

Accommodation—76 persons.

Type—Maisonettes with flats over.

Construction—Load bearing brick walls, fireproof floors and pitched roofs.

Contract Price—£31,230.

Special Features—Coats of Arms in handpainted tiles over main entrance doors. Tiles made by Students of the Camberwell School of Art.

★

CONTRACTOR: Galbraith Brothers Ltd., 34 & 35 High Holborn, London, W.C.1.

SUB-CONTRACTORS

Hollow Tile Floors: Kleine Floor Co., Ltd.

Roof Tiling: Finnis Nicholls Ltd.

Electrical Installation: South Metropolitan Electrical Supply Company.

Gas Installation: South Metropolitan Gas Company.

Sanitary Fittings: Rownson, Drew & Clydesdale Ltd.

Metal Door Frames: The Morris Singer Co. Ltd.

Flush Doors: Galbraith Brothers Ltd.

Wood Windows: Galbraith Brothers Ltd.

Artificial Stone: Stuart's Granolithic Ltd.

Ironmongery: Adrian Stokes Ltd.

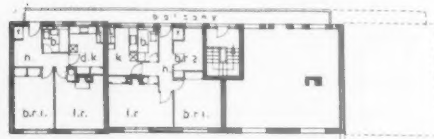
Fireplace Surrounds and Back Boilers: Broad & Company Ltd.

Floor Tiling: Jaconello Ltd.

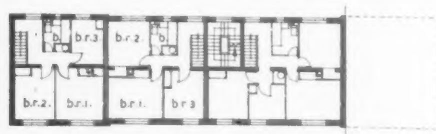
Alder Street Scheme

Hawkslade Road Scheme

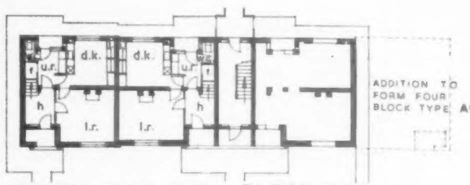
Melbourne Grove Scheme



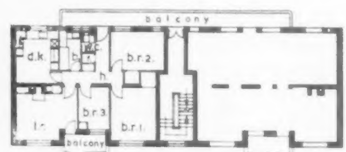
SECOND FLOOR PLAN



FIRST FLOOR PLAN



GROUND FLOOR PLAN · BLOCK TYPE A



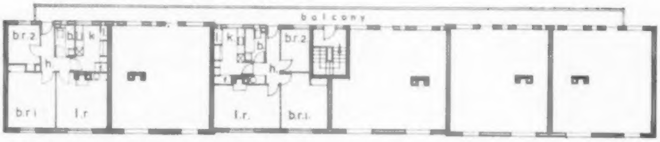
TYPICAL FLOOR PLAN · BLOCK TYPE B

MELBOURNE GROVE
LYTCOTT GROVE
PLAYFIELD CRESCENT

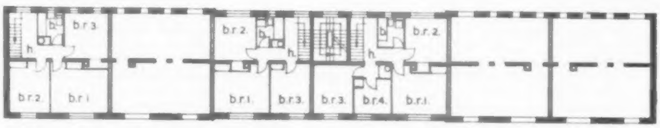
Number of Dwellings—56

Accommodation—	239 persons
Type—	Maisonettes with flats over
Construction—	Load bearing brick walls, fireproof floors and pitched roofs.
Contract Price—	£95,373.
Special Features—	Planning of certain blocks with front and back doors on street side and Living rooms facing gardens.

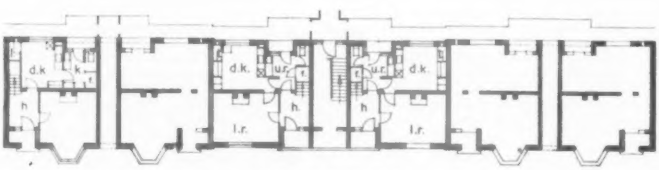
TYPE PLANS



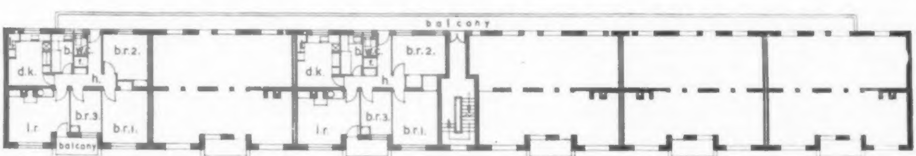
SECOND FLOOR PLAN



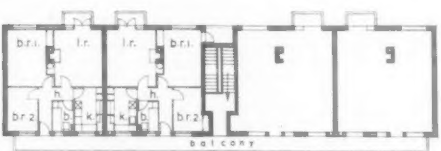
FIRST FLOOR PLAN



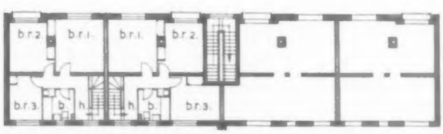
GROUND FLOOR PLAN · BLOCK TYPE A2



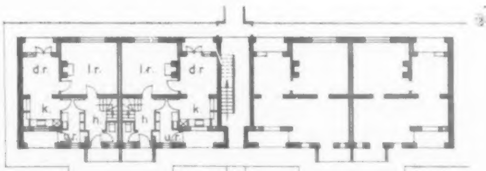
TYPICAL FLOOR PLAN · BLOCK TYPE C



SECOND FLOOR PLAN



FIRST FLOOR PLAN



GROUND FLOOR PLAN · BLOCK TYPE D

CONTRACTORS: Charles H. Graff Ltd., 2a Oakley Place, Old Kent Road, London, S.E.1.

SUB-CONTRACTORS

Hollow Tile Floors: The Helical Bar & Engineering Co. Ltd.
Roof Tiling: Finnis Nicholls Ltd.
Electrical Installation: London Electricity Board.
Gas Installations: South Metropolitan Gas Company.
Sanitary Fittings: Standard Range & Foundry Ltd.
Metal Door Frames: The Morris Singer Co. Ltd.
Flush Doors: Montague L. Meyer Ltd.
Wood Windows: Austins of East Ham Ltd.
Artificial Stone: Stuart's Granolithic Co. Ltd.
Ironmongery: Comyn Ching & Co. (London) Ltd.
Finlock Gutters: Finlock Gutters Ltd.
Fireplace Surrounds and Back Boilers: Broad & Co. Ltd.
Floor Tiling: Jaconello Ltd.

POINTS FROM PAPERS

THE LIGHTING OF BUILDINGS

Recent Studies at the Building Research Station

Extracts from an Architectural Science Board Lecture given on March 13 by W. A. ALLEN, B.Arch., A.R.I.B.A., and R. G. HOPKINSON, Ph.D., M.I.E.E., F.I.E.S., at a Joint Meeting of the R.I.B.A. and Illuminating Engineering Society

THE lighting engineering profession has confined itself in the lighting of buildings largely to the provision of artificial lighting on the working plane while architects have concentrated on the provision of natural lighting, and there is little overlap between the two professions. As a result natural lighting has been taken to be the architect's special province and he has tended to leave the provision of artificial lighting to the engineer. There is no advantage in such a division of interests, and we are devoting ourselves at the Building Research Station to the co-ordination both of the outlook and the practice of the engineer and the architect in all fields of the lighting of buildings.

In order to explain this approach it is necessary to go back briefly over the development of lighting practice up to the publication of Post-War Building Study No. 12, "The Lighting of Buildings." This was an attempt to sum up what was necessary for the architect to know of lighting practice as it was understood at the time, but was not limited to a summary. An attempt was made to look forward to new problems which were then arising.

In the training of the lighting practitioner, computation had usually been the starting point of the design process. A certain level of illumination is taken as an objective, the characteristics of output and distribution of the light sources (whether artificial or natural) are taken as known, the amounts of reflected light to be expected from walls, floor and ceiling are either neglected or are found by calculation or from tables; and an equation is written out which effectively relates *sources* to *requirements*. An allowance is made for reduction of light due to dirtying of windows or the diminution of output of artificial sources so that the system will run consistently at the desired level of illumination. Choice of light fittings or of windows is constrained to ensure limiting discomfort effects, and all these factors of design are reduced to arithmetic as far as possible. This approach is essentially computational and judgments are based on factors whose importance and weight have been measured and established. When the trainee passes out into the world of practice he is disciplined into a way of thinking which tends to avoid relying on imagination, and he comes to consider lighting as a geometrical or arithmetical puzzle which can be solved by calculation alone. This persists for the time which elapses between his training and his graduation as a fully competent lighting practitioner. It is at this stage that he realises that the computational approach to lighting can only get him a small part of the way.

The next stage in his development has been clearly and delightfully expounded by J. M. Waldram in his presidential address to the Illuminating Engineering Society entitled "Beyond Engineering." Waldram criticised orthodox lighting practice as not giving sufficient weight to factors which although at present somewhat intangible are easily recognised broadly as having much to do with beauty and emotional effect. Clearly he was right for there can be no justification for giving greater weight to one factor than to another merely because one has been reduced to simple arithmetic while the other has not. The "unknowns" may prove eventually to be more important that the "knowns" and there is evidence that illumination will give us the case in point before long.

Good illumination in fact can only be described as "good" when it gives suitable conditions for visual requirements, when it gives a high order of comfort, when it stimulates people to the feelings appropriate for what they are doing, and when its character is that of the building it lights and the illumination confirms the character of the building. It may be that we will never have a detailed technological basis for predicting emotional reactions and we are less likely to obtain it for character, yet these are likely to be as important as any of the other criteria. Personal judgment must be a primary force in good design and computation can never be a substitute for the artistry of a good designer. It is necessary for everyone at all times to recognise the right place for computation as an aid or a servant, and not the master of a designer.

Good lighting, then, concerns not the working plane only or mainly, but the whole environment, and our problem is to develop balanced views about the lighting treatment. Many of us have been impressed by the flow of literature from the United States of America about brightness engineering as they understand the term in that country, and it has this to its credit that it is a study of the whole environment. Careful examination of it shows much need for modification however, in particular the implicit limitations of brightness lead to rather flat, featureless, abstemious kinds of illumination, in which the development of character is handicapped.

The problem therefore is as usual to take what seems good out of what exists and keep it and to add other ideas when possible in the effort to get our knowledge in the same balance as our impressions and feelings, so that each helps to raise the other to increasingly higher states of sensitivity.

Lighting and Vision

Foremost amongst the factors which are not yet readily computed are the phenomena which are linked together under the general term "glare." They are subjective; that is to say they are resident in the observer himself and can be detected only subjectively.

It is not easy to define glare precisely and it is often more useful to analyse its effects on vision, which can be separated into two fairly distinct manifestations. First there is the effect which glare has on the ability to see, for the presence of bright light sources in the field of view will affect the ability to see objects in other parts of the field. For example, it is often difficult to see details immediately above a window because of the glare from the bright sky just below. This direct disabling effect is due to the inability of the eye to adapt to widely differing conditions in the field of view, and it tends to adapt to the brighter parts of the field to the detriment of vision in areas which are in shadow. The disabling effects can be traced directly to the total amount of light which reaches the eye from the glare source, and are not dependent on its brightness alone.

The sensation of discomfort associated with bright light sources in the field of view is something which is believed to be largely distinct from the disabling effect, for either may be present without the other. This is not generally realised, perhaps because severe conditions of disability glare are almost always accompanied by sensations of discomfort or even pain; certainly the impression has arisen that disability and discomfort effects are merely different degrees of the same thing. It can be demonstrated by a simple experiment that certain situations quite common in practice can give rise to severe discomfort without any noticeable disability. It is less common, but nevertheless of definite practical importance that other conditions can give rise to no noticeable discomfort and yet a marked deterioration of vision can result.

Discomfort without disability arises in very bright surroundings when light sources of intense brightness are visible. Such instances are by no means uncommon, unfortunately, in current lighting practice. Drawing offices lighted to high levels of illumination with rows of fluorescent lamps freely exposed suffer noticeable discomfort without any appreciable direct disability, while disability without discomfort arises when the levels of illuminations are low and the lighting is provided from very large sources of low brightness, as for example, with a large window. On a day with dull overcast sky this will constitute a disability glare source. The eye will adapt to the brightness of the sky as seen through the window and as a result will be unable to distinguish details of objects in the darker parts of the room. Screening the eyes from the window will assist adaptation and it will then be possible to distinguish the objects in the darker parts of the room quite readily.

It has been established by experiment that the sensation of discomfort which arises from the glaring light source is due partly to the total amount of light which reaches the eye from it and partly to its brightness. The disabling effects of the glare source on the other hand are not dependent on the source brightness, but are determined by the illumination produced at the eye, i.e., by the intensity and the distance of the source. It is not correct to state as has sometimes been done that the disabling effect of the glare source is due entirely to its intensity and the discomfort effect is due entirely to the source brightness. The sensation of discomfort is dependent not only on the *source brightness* but also on the *source intensity*. A fluorescent lamp whose brightness is sufficiently low to render it free from any responsibility for a sensation of discomfort when mounted on a street lighting unit 60 feet from the observer's eye will nevertheless be extremely uncomfortable if mounted above his desk so that he can see it 4 feet away from him. The brightness of the lamp is exactly the same in both cases but the illumination on his eye is very different indeed. It is astonishing that this fact, of major importance, is still unrecognised in any modern lighting code of practice.

The difficulty in identifying the characteristics which determine glare, both in natural and artificial lighting, has had serious consequences. In the field of natural lighting we can regret our failures to maintain and surpass the standards of lighting design exemplified in the best of the Gothic and Georgian traditions. In the field of artificial lighting the chief error seems to have been the lack of control over the source brightness in the directions in which it will be visible to the eye, and the failure to appreciate the dependence of the sensation of discomfort on the total illumination reaching the eye from the glare

source. It has not always been appreciated that a lighting unit which gives a high output of light must necessarily have a lower surface brightness if the discomfort is to be avoided. These difficulties have arisen due to economic considerations and of course they are not traps into which competent lighting consultants have fallen; nevertheless it must be accepted that they do exist in sufficient amount to cause a major problem at present, and the work of the B.R.S. has been directed towards finding some reasonably simple and economic solutions to them.

The lighting of the working plane itself has been given most of the attention of investigators, and the basic studies, such as the early work of Koenig and the more recent work of Lythgoe, Weston and Luckish are well known. For the moment, therefore, the discussion will be confined to visual effects which are equally as important to good lighting, but which have received comparatively little attention.

The visual mechanism has been and is being studied in considerable detail, but as the experimental findings mount up, our conception of the mechanism is not clarified—rather the reverse. Fortunately certain well-defined characteristics can be understood in the light of existing knowledge with sufficient clarity to determine the factors that govern good lighting. One of the most important which the lighting designer has to consider is the desire to divert the eyes towards light. We can call this, on the botanical analogy "phototropism," meaning the arrangement or orientation of the human observer towards the light. Phototropism is a reflex action. It follows that any lighting installation which is planned like American "Brightness Engineering" to render all parts of the field of view of uniform brightness will fail to make use of the phototropic mechanism. If it is desired to maintain attention on a particular area in the field of view—for example, the work—it follows that the visual process itself will assist in maintaining attention if the work is the brightest part of the field of view.

There are other reasons why the brightest part of the field of view should be the working area. Investigations such as those of Koenig and Lythgoe have shown that visual perception of fine detail is at its best when the visual task is a little brighter than the surroundings. But then a conflict appears; the maximum phototropic effect arises when the visual task is very bright and the surroundings are very dark, while the maximum visual acuity arises when the surroundings are only a little less bright than the task.

Another factor is ease of seeing and the sensation of comfort. The conditions for maximum phototropic effect are not comfortable. The eyes desire a rest, but are under continual constraint to turn themselves back to the task. On the other hand the conditions for maximum acuity are again not comfortable. The eyes have no "resting place" in the uniform field of view. The ideal situation from the standpoint of comfort is a compromise, in which the visual task is the brightest object in the field of view, and the surroundings are well-lighted but to a somewhat lower level. The precise ratio of the brightness of task to that of its surroundings depends on the relative importance of visual comfort, visual acuity, and constant attention to the work.

In practice the brightest objects in the field of view have often of necessity to be the sources of light—the windows or the lighting units. The eyes will naturally gravitate towards them unless they are well removed from the direction of the visual task, but it must be accepted that this is not always possible, and indeed not always desirable. The provision of a "view window" as a visual resting place is good technique, provided full use is made of acceptable methods such as "contrast grading," for reducing any sensation of glare discomfort which might otherwise result.

In determining the optimum brightness of the objects of attention, the designer can call on a sufficient body of experimentation to supply the essential needs. The experimentation is based partly on direct experience and partly on an analysis of the factors which go to make up the visual task. These have been reduced to two by Benttell and Weston, the apparent size of the critical detail of the task, and the contrast between the detail and its background. It is thus possible to draw up a simple table relating these factors to the amount of light (illumination) necessary for the work.

A task involving fine detail on backgrounds of high reflection factor demands a very high illumination level which results in a very high brightness to the visual task. It will follow from what has been said earlier that for optimum visual acuity the surroundings to the task should also be bright. Similarly, a very high illumination on a task of high reflection factor may actually constitute a glare source if the background (i.e., the general surroundings) are not bright. On the other hand, the concentrating effect of the bright task in dark surroundings—phototropism—has been noted. The table illustrates these points.

	Background	Acuity	Comfort	Phototropic effect
Visual task bright	Dark	Not good	Definite discomfort	Optimum
	Intermediate	Appr'ching optimum	Optimum	Reduced
	Bright	Optimum	Reduced	Absent
	Brighter than task	Not good	Definite discomfort	Absent

The effect of the Task Brightness and its background.

The phototropic effect and the requirements of high visual acuity are thus in opposition to some extent. However, in the same way that "contrast grading" can alleviate discomfort from a glare source, contrast grading can assist the compromise inherent in the relation between the brightness of the visual task and its background.

The experiments on which this suggestion is based are complete as far as they go, but for rigid statistical confirmation much more remains to be done. The evidence so far obtained indicates that, if the immediate surroundings to the visual task (e.g., the writing table, or the surround to the television screen) are sufficiently large in relation to the size of the task itself, and are of a brightness intermediate between that of the task and that of the general surroundings, a better compromise between visual acuity, visual comfort and the phototropic effect can be produced.

Here we must consider the influence of the brightness of the surroundings and of the task on one another. The eye tends to adapt to the average brightness of the field of view, and in doing so determines its sensitivity to any particular brightness in the field of view. If the surroundings to the visual task are brighter than the task the eye, tending to adapt to the brightness of the surroundings, will see the task as a much darker area than a physical measurement of the task brightness would suggest. Conversely, if the surroundings are darker than the task, this will appear, by virtue of the enhanced contrast, brighter than a physical measurement of the task brightness would suggest. The influence of the surrounding brightness on the task brightness is of major importance, and detailed studies have been made which permit the effect to be appraised quantitatively.

Finally, we must consider the appraisal of the brightness of the whole field of view. If this is of uniform brightness, there is great difficulty in assessing how bright it is. The eye needs contrasts in order to assess absolute values of brightness. In judging whether the scene is bright, dull, or gloomy, the eye makes certain comparisons which are not yet clearly understood. Bright pin points of light undoubtedly give an impression of high general brightness of the whole scene, as display lighting specialists well know. Direct experiments at the B.R.S. have shown that a room lighted to a certain level of brightness with low contrasts is judged duller (i.e., less bright) than a room lighted to the same level of brightness but with small brilliant sources of light in the field of view. Such sources need not cause discomfort if they are restricted in candlepower, and if they are provided with "contrast grading" surrounds. The proper provision of "sparkle" in a room can make a real contribution to the impression that it is well lighted.

We arrive therefore at the following general principles.

(A) By good lighting we mean the most effective compromise between lighting that yields maximum visual performance, visual acuity, comfort, attention to the work, and general overall brilliance. This compromise must be related to the purpose of the lighting and the character of the building.

(B) In arriving at the right compromise we have to consider the following points:

(i) For maximum acuity the work should be the brightest part of the field of view and the surroundings should be only a little less bright; acuity is greater the brighter the task, up to maximum daylight levels experienced outdoors.

(ii) For maximum comfort the work should be the brightest part of the field of view and the immediate surroundings should grade off into the general surroundings of lower brightness. There is a limit to the maximum task brightness for visual comfort, which may be of the order of 500 ft. lamberts.

(iii) For maximum concentration the centre of interest should be very bright, colourful and brilliant and the surroundings should be dark.

(iv) For maximum overall brilliance there should be brilliant sources of light suitably placed in the field of view. These sources should be of low intensity (but high brightness) to avoid glare discomfort. Otherwise they should be graded into the background.

Desired Effect	Work	Surround
Maximum Acuity	Work very bright	Almost as bright
Maximum Attention	Very bright	Dark
Maximum comfort	Less bright	Graded into lower brightness
Maximum 'brilliance'	Bright and varied	Bright, varied, with 'points' of high brightness

Compromises in good lighting.

(C) In general, where, as in work places, brilliance is not an essential feature of lighting, drabness should nevertheless be avoided. It is often a great advantage to have sparkle on the centre of interest, for example, on machines. This need for sparkle does not depend on the result of formal experimentation but there is a great deal of circumstantial evidence for it and there is a persistent tradition throughout history. Totally indirect lighting of flat surfaces tends to be soporific. Interest is aroused by variety in the brightness pattern. For this reason there is also an advantage in

a view of the lighting fittings and of the windows and again for these to be on non-uniform brightness. Glare discomfort can be avoided by the use of contrast grading in the design.

* * *

These are principles, not design rules. It is possible that they could be constrained to fit into a series of design rules, but at the moment we do not feel that this is the basis of a good technology. Some assistance on the technological side may eventually be necessary but for now it may be of more value and interest to discuss some cases where these principles have been applied, some deliberately and others intuitively. No degree of finality is suggested in them; they represent stages of study.

(1)	The object of attention should be the brightest part of the field of view.
(2)	The local surround to the work, and the general background, should be of progressively lower brightness.
(3)	The sources of light, should be limited in brightness and/or area and should be graded into their surroundings.

Some principles of good lighting.

Examples Analysed

We give considerable attention to windows at the Building Research Station and quite often we look back to established traditions of window design to see if what we think we know is able to explain what was found after long experience to be good. A technique of design only became an established tradition if it worked and it can be taken for granted that if a tradition survived for a long period in the hands of sensitive artists then it had struck reasonably near to the right balance of human requirements. Such was the Georgian window at its best and in Figure 1 is an example which appears to be very nearly perfect. This was photographed by courtesy of the Architectural Association in their library.

What made it so good? Consider the tapered window bars free from shadows which can contrast with any view of sky. Look also at the contrast grading provided by the reveals, white on the outside where they are seen next to the sky, then the lowered brightness of the inside splay making altogether two steps intermediate between the sky and the interior face of the walls. Note also that the frame is so fine that its shadow scarcely disturbs the grading. Then consider the usefulness of the low sill in ensuring the minimum shadow between external brightness and the pool of light on the floor; also the value of the pool to throw light back on to the surrounding walls to reduce contrasts still further. The same thing often happens on the ceiling near the top of the window and is an advantage of the high lintel. Then the thickness of the walls is observed to be an important point in cutting out view of sky which might otherwise cause glare discomfort. And finally, not apparent in the photograph, is the advantage of the high lintel in permitting a deep penetration of direct light on to the working plane and, usually entirely forgotten, the equal merit of the low sill in permitting a deep penetration of light reflected from the street or garden on to the ceiling. Obviously we can explain now a good many reasons for success in the

Variation in quality of Georgian window. Fig. 1. shows good design with good contrast grading while Fig. 2 shows an equally shapely design, but with poor contract grading, due to use of dark wood and poor light reflection inside. Figs. 3 and 4 show type of classroom with clerestories on any number of sides, combined with vision-strip window. The cross-lighting and reduction in the view of sky contribute to minimise discomfort. (Herts County Council School).

FIG. 2

FIG. 3

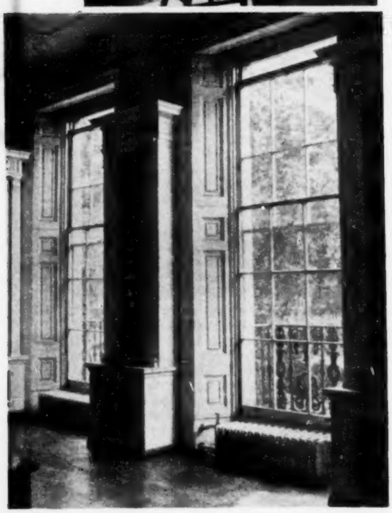


FIG. 1

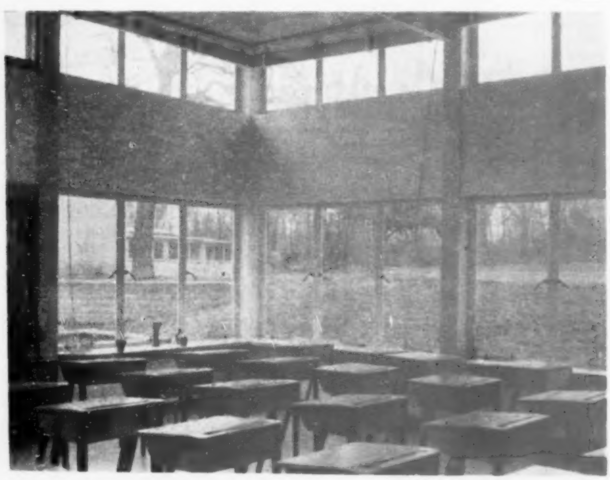


FIG. 4

tradition, and it gives confidence that modern knowledge is somewhere near a reasonable balance in the weight it gives to various factors.

Such fine standards were not consistently maintained, of course. The factors were not understood explicitly and the desire to be novel was as great a temptation then as now. Figure 2 gives an example of a well-proportioned but poor window, difficult to photograph because of the contrast, but not far from the truth as shown. Most of the trouble here is caused simply by the use of dark natural wood surfaces instead of light colours.

Much of modern window design has found its way towards sound practice, though even more has probably slipped quite badly. One of the successful innovations undoubtedly is the use of windows from wall to wall in a room, which avoids contrasting shadows at the ends. Less successful often is the window wall which by presenting a large angular size causes discomfort which goes part way to offset the improvements resulting from having no frame of contrasts around the edges. Fortunately it does not offset them entirely, for studies of post-war classrooms in schools, where window walls are frequent, indicate that teachers find these rooms appreciably better than orthodox pre-war designs.

Nevertheless the search for a modified window wall goes forward, showing an instinctive sensitivity of designers to causes of discomfort. Tinted glass, special glass of other kinds, louvres, louvre blinds, and net curtains all function by contributing to reduce the intensity from the sky or to reduce contrast, or both. Often a simple reduction of area may be sufficient, and some of the recent Hertfordshire schools have an interesting window treatment as shown in Figures 3 and 4. The place of a window wall is taken by a view-window and a clerestory, with a panel between which reduces the area of sky seen in that view, while adjacent clerestories light the panel to increase its brightness, so that contrasts are minimised. Now the lower ceilings of classrooms needed for economy are forcing another approach using top lights and long horizontal view windows, and this has a chance to prove very successful.

One remarkable point about the design of these notable schools is the way in which windows and top lights are placed in relation to coloured surfaces so that the latter present themselves as they were intended to do. Much modern colour work is done without the realisation that light will play a part in the picture formed for the viewer; light and colour go together in one concept of design. Figure 5, which shows a window placed so as to light a coloured wall in one of these schools, and Figure 6 shows the delicacy of design made possible by the discriminating use of fixed glazing on thin metal bars.

The purpose of this group of examples is to show simply that there is a thread of consistent ideas running through the best of traditional design and struggling to display itself in contemporary windows and that the group of ideas is in fact our stated group of principles. Contrast grading, the size of the visible patch of sky, and the relation of lighting to the brightness of surfaces, all these are evidently factors of importance. When windows are holes in walls contrast grading and a limited view of sky are desirable; when walls are wholly windows, contrasts are minimised but brightness and intensity may be excessive. The view-window has its value but the large window framed on all sides by dark surrounding wall areas can be one of the worst possible combinations.

But this problem of window design is only an example of how to handle a light source and it tells us little of the lighting of things to which we want to give attention inside. The example which follows was worked out largely in terms of the objects of attention, which in this case were looms in a woollen weaving shed.

The circumstances were that the owners of the mill had taken an interest in lighting and colour studies at the B.R.S. and had offered their premises as a trial ground. In the event, it was thought desirable to improve the illumination and to reduce the noisiness of the place and to make the whole building a demonstration of modern treatment for a good working environment.

In terms of our principles the work should be preferentially bright and the lighting should be stimulating. This was particularly important because night shifts are normally worked in this mill.

It was felt that illumination by fluorescent sources alone would be too uniform to bring out to best advantage details of faults on the cloth and it was decided to introduce some filament sources. In the event these were highly successful but not for the expected reasons. Resolution of detail on the cloth did not seem to be greatly improved, but the highlights and clear shadows which formed on the loom as a whole had a most marked stimulating effect, inducing a heightened sense of alertness in the operatives. This appears to be a very useful aid in giving attention to the machine (which is a major factor in this kind of production) and especially is this the case in the early hours of the morning when the night shift is on. It is our view at the Building Research Station that mixtures of filament and fluorescent sources are more

FIG. 5

Lighting and colour designed together. The panel is one of a succession seen in one vista, each panel vividly coloured and deliberately lighted by adjacent windows. (Herts County Council School).

FIG. 6

Fixed glazing, showing the value of thin glazing bars to reduce the contrast effect. Note also the location of the roof light to illuminate the mural. (Herts County Council School).

FIG. 7

B.R.S. experimental factory lighting. A fluorescent unit designed to light both ceiling and working plane to reduce contrast and give full value to ceiling colour. The filament unit is used to give stimulation effects. (H. Rhodes & Bros Ltd)

widely desirable than is usually assumed. The reason is partly to bring out shapes accurately, and partly to cause bright reflections from relevant parts of the field of view to give stimulation and the impression of brilliance. It may well be that the new filament lamp ballast in fluorescent lighting will serve a useful purpose in this way.

It has proved to be generally undesirable to have high reflection factors on walls because they so often are backgrounds to views of work which seldom has a high reflection factor. The main walls were therefore kept to a moderate reflection factor. The wall nearest the looms, which is at a right angle to the north light roof, is a pure red which was felt to be desirably enlivening (bearing in mind again the night shift) and by making the shape of the walls very clear in relation to the asymmetrical roof, it helps to bring out the character of the building. The opposite wall near areas which are less frequently used is a blue and serves the purpose of bringing out by contrast the full colour value of the wicker baskets kept in this area. When a strong colour such as that of the baskets exists in a building the choice of other colours must be made in relation to it. It is not always the case that walls should be of such low reflectance and for the end wall which one sees when facing the north light a lighter colour was used because the brightness of the view of sky made a dark colour nearly unacceptable.

Moving to the upper regions of the building the trestles and window bars are white because these are both seen against the view of sky. White or very pale colours are necessary in such positions to minimise contrasts. The ceiling was either a pale biscuit (the native colour of the sound absorbent) or a pale grey and was so coloured to throw into high relief the white trusses which thereby made their own contribution to the character of the building. A point which is particularly desired to stress by this example is the way in which colour and illumination are intimately related in modern practice each being related in turn to visual requirements and to the character of the building.

The effectiveness of the roof colouring naturally depends on its being well illuminated, especially in the middle of the night, and to ensure this a fluorescent fitting was designed which let nearly as much light go upward as downward. (Figure 7.) It is important to note, however, that the light which was allowed to go upward was not "lost," because of the high reflection factor of the upper surfaces of the factory. The other chief characteristics of the fitting were a low brightness as seen sideways due to the use of suitable opal Perspex, and an angle of cut off rather steeper than usual. The louvres are pale blue and provide a pleasing touch of colour well related to the building. The filament sources were simple metal reflectors directing their whole flux downward within the narrow angle of 25 degrees from the vertical, each source covering two looms. It seems to us at the moment to be fairly important when mixing these two kinds of source to screen at least one of them effectively so as to avoid conflicts of colour; the two lights can obviously blend well on the working plane but the sources themselves do not always look well together.

A simple example of the same idea used in reverse occurred at the Building Research Station itself where the lighting of the carpenter shop became a cause of complaint. It was decided to test ingenuity by using exactly the same sources and wattage in a new solution. The appearance before and after treatment is shown in Figures 8 and 9 and one of the chief elements in it was simply to take the six existing fluorescent troughs and put them upside down in the trusses so that the light was directed on to the ceiling. This reduced the illumination level on the working plane but greatly improved the lighting.

In this same shop occurred an excellent example of another point of principle. The planer displayed a strong specular reflection on the main table of one of the filament units and it forcibly pulled one's attention away from the work point, and was of course highly undesirable. Various treatments were considered but the best seemed likely to be simply to remove the source so that the reflection came on the work point itself. It appears to have succeeded. This solution is hardly orthodox and seldom wise, but it illustrates the variety of ways in which one may have to use light sources to get good lighting, and many examples could be found. In our view it is one of the fields of lighting most widely open to improvement, and sparkle, clarity, and preferential brightness seem to be the vital points to go for. We must not pass beyond this stage without referring to the valuable

Glaring lighting in a workshop (Fig. 8) relieved without increasing wastage by inverting all the fluorescent units to light the ceiling (Fig. 9). Demonstrating value of reduced contrasts

FIG. 8

FIG. 9

work of H. C. Weston on the analysis of the visual task, as he describes it in his book, "Sight, Light and Efficiency," for this makes one deeply sensitive to visual requirements relating to work. Equally we must record our appreciation of the work of our colleagues, H. L. Gloag, who has been responsible for a clarification of the principles which govern the colour treatment of buildings in relation to their lighting requirements.

Factories, of course, present so many difficult visual problems that one could easily slip into the view that other building types are less exacting, our last example therefore; will come from a very different type of building—an art gallery.

Art galleries have had an intensive study at the Building Research Station since the war. They present a problem of refined standards of illumination because the contents are visual displays; and there have been papers, books and articles on the subject at frequent intervals for over a century. The odd and depressing fact has to be recorded that very few of the galleries built so far have enjoyed freedom from valid criticism. This makes us cautious in claiming any advances, but it is believed at the Station that the modern researches in illumination and vision which have given such a useful lead in tackling factory problems give an equal advantage in facing those of all other types of building.

Broadly speaking, three types of top-lit gallery have been used by architects, one where there is a vault with a roof light along the crown, one where there are divided openings for light and a third which consists of opposed clerestories. The latter can be left out of our discussion because of the glare which faces anyone who looks towards a picture wall, but the others are worth attention.

The great vaulted galleries have almost all suffered from the disadvantage that the upper parts of the walls received far more light than the picture areas farther down. This no doubt happened because the principle of lighting the object of attention was not clearly established, and even if it had been well known, no methods of predicting daylight distribution existed until relatively recently. It is possible to do a vault design with a good distribution, but only when the control of distribution is understood.

There is a second fault with the exposed skylights used in vaults, for visitors are generally adapted to relatively low brightness levels and find the intensity of light from the large view of sky too great for comfort. This was evident very quickly to at least one critic, C. P. Cockerell, who gave evidence before the Select Committee of 1850 on the National Gallery. At that time it was still new, yet Cockerell put forward a design with a central ceiling to screen the sky. What is still more to his credit, he realised that if opaque it might seem too dark, so he proposed a translucent screen. His design was not built.

However, either his ideas bore fruit, or subsequent designers realised the same point, for a number of galleries were built along similar lines. Unfortunately they used opaque ceilings, and not only suffered from having too much light on the uppor parts of walls, but had shadows on the floor.

Once these points were appreciated a much more direct attack could be made upon design, and the Research Station has taken advantage of requests for help by putting forward designs which incorporated the modern views on illumination. One of these, shown in Figure 10, was prepared for the Birmingham Civic authorities and is to form the basis for reconstruction of their war-damaged rooms.

The essential features are these. From the centre of the picture zone a full view of sky is ensured, while the "knee" which takes the place of the common cornice reduces the light reaching the walls above the pictures; the distribution curve is on the development sketches in the Figure, and shows that the largest daylight factors are on the picture zone. The underside of the "knee" is at a sufficient slope to receive some slight direct light from the sky, and it also has reasonable reflected light from other surfaces. It is important to avoid full shadows any where in this region.

Screening of the view of sky is by a "velarium" which is to be an egg-crate, and one louvre is introduced on each side to screen the view of sky between the velarium and the edge of the roof-light.

These are the chief structural features in design, and they serve to avoid glare-discomfort from the skylight and to ensure a suitable distribution on the walls and across the floor. They do not, however, ensure the correct brightness distribution, for that depends not only on the distribution of light but also on the reflection factors of walls.

The pictures are the objects of attention. They should be at least as bright as their immediate surroundings. Since they receive

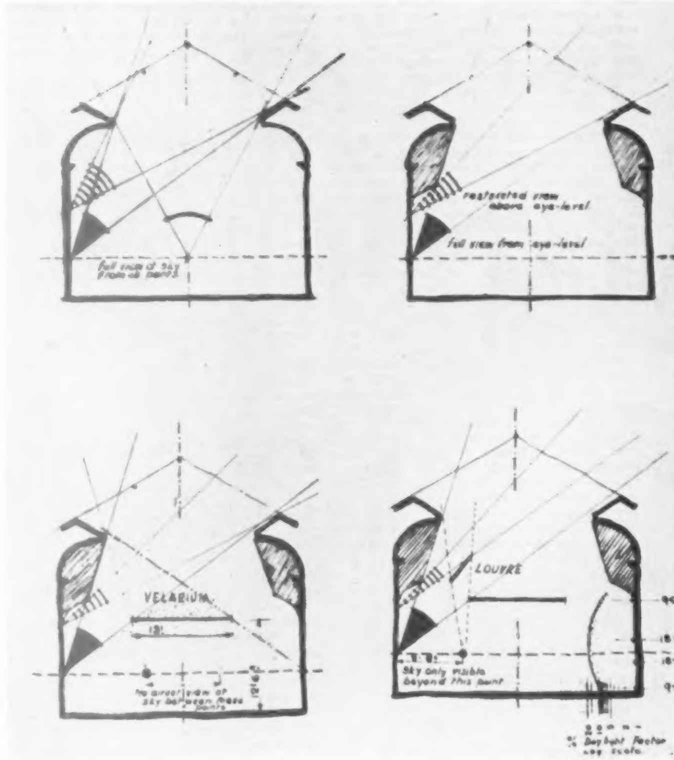


FIG. 10

FIG. 11

Fig. 10. The development of improved top-lighting for an art gallery shows change in cornice treatment to control distribution of light on walls, with louvre and velarium to reduce sky glare. Fig. 11 shows model of the gallery.

the same illumination, it follows that the wall surface should be of about the same reflection factor. Rather unexpectedly, a study of reflection factors of pictures showed that the great majority have reflection factors of between 15 and 25 per cent., and with this information it was decided to try wall coverings with reflection factors of about 20 per cent.

At this level reds, greens and blues are the colours which occur in purity. Blue was discarded as being too disturbing when seen in the peripheral field of view, and reds and greens, two of the traditional colours, remain. Of these, green has often been used for portraits and red for other types of subjects, and this tradition seems sound. In our model trials we used red only, and to our considerable surprise chose a red pattern almost identical with reds in a room at the National Gallery which has long had a good reputation for picture display. This then seems another example where modern study has confirmed a long tradition.

Naturally there is a tendency to use lighter colours to-day, but evidence suggests that this is often done to avoid undesirable contrasts with the views of sky and to improve the distribution of reflected light. On the other hand there seems no doubt that colours with reflection factors of 20-30 per cent. provide better backgrounds for furniture, pictures, and human beings rather than the higher values often in use in recent years. It seems that with more skilful handling of daylight and artificial lighting we will be able to work downward again safely to the lower value backgrounds.

In this vein it should be remarked that the reflection factors of the lower and upper surfaces of the "knee" which replaces the cornice, were adjusted in the model studies so that they compensated for the respectively lower and higher amounts of light reaching them. Had the roof-light been exposed, contrast grading towards it would have been necessary, but the screening of it removed the need and all surfaces in view were therefore brought to about the same brightness as that of the picture wall.

Lighting engineers will appreciate that the basis of this treatment is the provision of correct adaptation conditions with attention to the *luminosity* (i.e., the apparent brightness) of the pictures, rather than to their *luminance* (physical brightness).

This is a very brief account of the main points of a design which reflects to an exceptional degree the views on lighting and colour which have resulted from the modern researches.

The Future

Architectural design is not always regarded as having a part in the grand strategy of experimental studies, but quite clearly it is the full-scale testing ground of ideas and perhaps it is more than that, for the critical study of architecture past or present is a means of identifying problems requiring laboratory study. Contrast grading and the discomfort effects of large windows are two problems where critical studies of design have helped to provide starting points for laboratory research.

Much study lies before us and we see a clear path ahead in experimental work, though it is a path always liable to become a maze as further research on vision and human psychology complicates our picture of how the eye and the mind work and co-ordinate their activities. Our path is the study of the brightness pattern in the field of view, and of those lighting factors which have the greatest influence on the well-being of the occupants of a building. Recent researches, such as those described in the body of the paper, have given us more confidence than hitherto in the basis of our codes of practice on illumination level, and there is enough information now available to codify the factors which govern glare, and, to a lesser extent, concentration of attention and general overall effectiveness.

Our greatest need is knowledge of those lighting factors which determine the long-term psychological states, the degree of well-being or of fatigue after a day's work, or a year's work in a given environment. We have endeavoured to make good this lack by assuming that the relation between the factors which govern long-term fatigue effects will be a derivative of that which governs short-term fatigue, and for this view we have the backing of leading psychologists. But it is recognised that experimental proof is necessary, and is essential to determine detailed and absolute values. A glare source which is found to be "just acceptable" on a short-term study may give rise eventually to glare-fatigue if it is constantly in the field of view. The modification to the short-term comfort brightness of the source, that is, the "factor of safety," can be determined only by experience or by direct experiment.

Long-term experiments are not easy to conduct. This is partly because observers free and willing to undergo the test are not readily available, partly because the experimental conditions cannot be controlled over a long period, and partly because the design of the experiment must, if it is to carry conviction, be based on the cumbrous dictates of modern statistical procedure. (The architect often fails to appreciate how much time the experimenter must spare on obtaining a rigorous statistical proof of an effect which can often be clearly demonstrated and which the architect is prepared to accept on the basis of his observation, judgment, and common sense.) Some long-term experiments on lighting have been carried out, especially in other countries, and these have been of value; but in many cases they have been criticised because the variables were insufficiently under control, and also, it must be admitted, because of the human reluctance of independent observers to accept conclusions which so forcibly aid the commercial interests of the sponsors of the experiments.

Recently the B.R.S. has explored the possibility of using short-term physiological tests as a means of detecting conditions which in time would lead to long-term fatigue. It will be recalled that Luckesh, in the U.S.A., and others attempted to correlate blink rates, heart-beat rates, and nervous muscular tension with lighting factors, with a similar objective. A tempting line of study is exploration with electronic devices, like the electro-encephalogram, for recording the mass potentials which are generated between different parts of the body when visual stimuli are presented. Informed opinion holds out little prospect at present of any useful correlation being established between such physiological factors and the long-term fatigue effects, but informed opinion is of course often conservative.

At the moment there remain the duller but relevant tasks of deriving a more complete technology for the engineering of the visual field than that which we have been able to describe in the paper. This task calls for co-operation between the various research groups who have interested themselves in it. Individual progress in parallel is expensive and slow. Each single group cannot undertake alone and in competition the field tests, the laboratory experiments, and the design work which the project demands. The purpose of this paper will have been achieved if it arouses interest among architects and engineers to co-operate with agreed objects in view. In particular the need exists for more investigation of those factors which govern psychological states at the observer end, and texture and brilliance at the lighting end, and more attempts in building design to give conscious expression to developments of theory. This is the way rapid advances will be made towards a reliable sub-conscious basis for imaginative, sound design.

For our last words let us glimpse around us at a wider prospect, for lighting is to the building designer merely one of three means at his disposal for his attack upon the human mind. A person's experience of buildings is received either through his skin receptors (for his thermal state) or his hearing or his vision. Each of these receives attention from separate groups of sciences and technologies, each investigating largely for its own purpose rather than for those of a whole building.

The remarkable thing is that we now begin to see how similar are our reactions to similar kinds of stimuli around us. We have for too long overlooked the fact that contrast grading for instance, is as necessary to thermal comfort as to comfortable illumination, or that the proper relation between direct and reverberant sound in a concert hall is as important to one's feeling of stimulation as is brilliance in lighting, or an open fire in heating. Here, in comparisons between the known reactions of our different senses, are to be found the confirmations we need to guide us towards the fundamentals of sound design, and here we have once again a reminder of the importance to each other of sensitive architectural study, sensitive laboratory research, and sensitive technological practice.

In Parliament (*continued*)

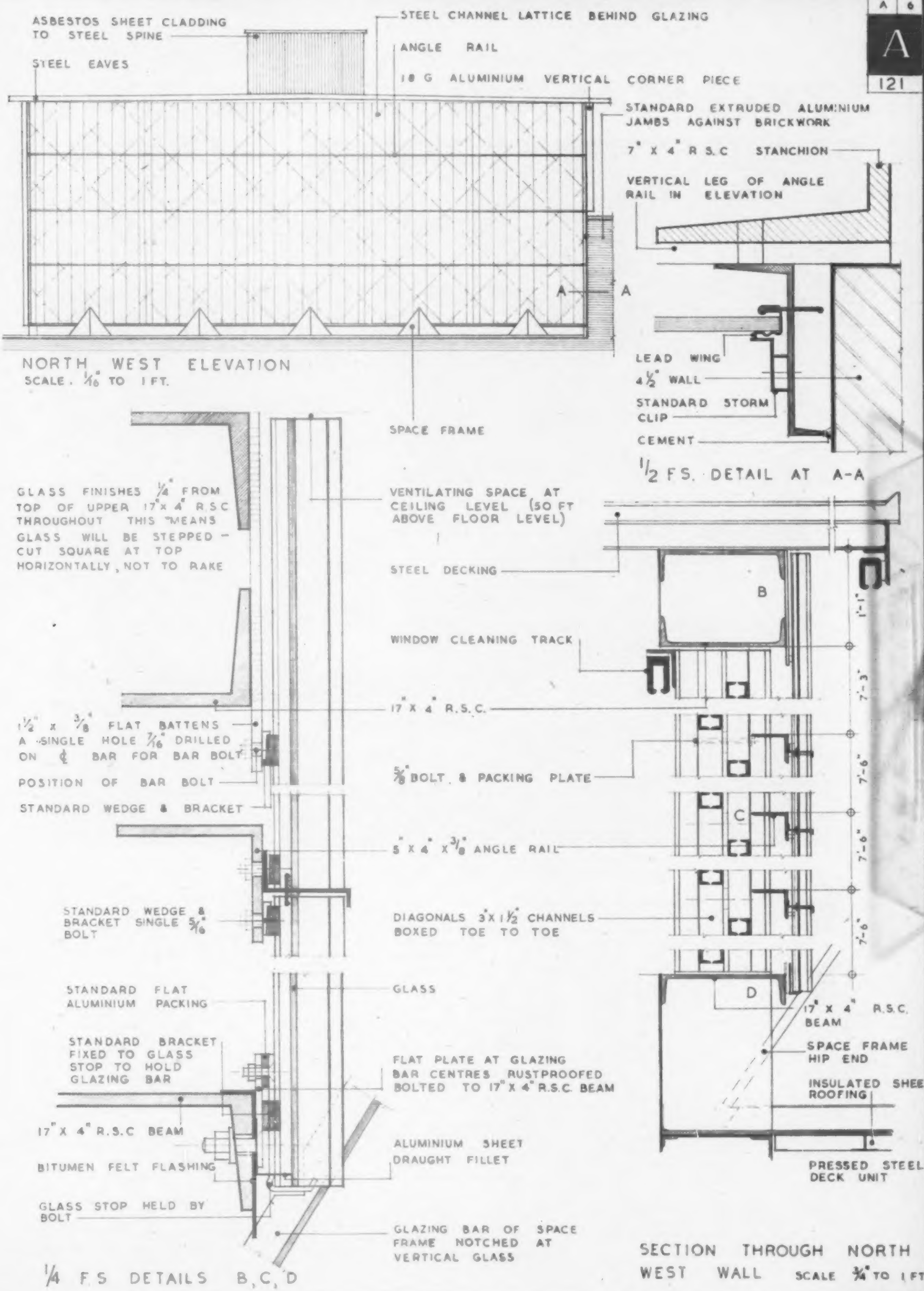
Thirty Years After

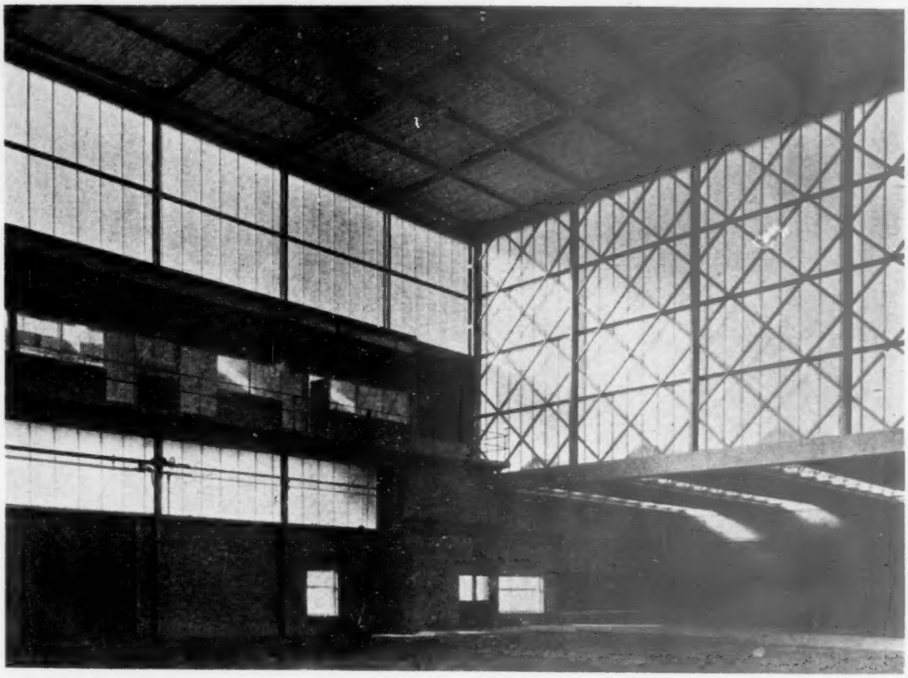
Mr. Vane asked the Minister of Agriculture what experiments his Department had carried out in building agricultural houses and buildings in pisé de terre and stabilised earth. **Mr. G. Brown,** the Parliamentary Secretary, said that none had been carried out by the Department. Experiments in building in pisé de terre were designed by the Department of Scientific and Industrial Research and built on the Ministry's small-holdings estate at Amesbury (Wiltshire) in 1919, and a report on this was published in 1921.

Then Mr. Vane asked if these buildings had proved satisfactory after 30 years of life, commenting that that was more important than a report two years after erection. Mr. Brown's answer was that the buildings were still there, and no special maintenance problems had been experienced. (Mar. 22.)

B.E.A. Office Building

The Minister of Fuel and Power stated on March 19 that during 1950 and 1951 he had authorised the 14 divisions of the British Electricity Authority and the 14 area boards to proceed with 102 projects for new offices and administrative centres, and for structural alterations to existing offices and centres. The estimated cost of these projects amounted in all to £400,709. About 75 standards of softwood would be required, but as no licences were needed for steel, cement and bricks, the figures of the quantities of these material required were not available. These works had no priority, and he could not say to what extent the defence programme might make it necessary to defer them.


ASBESTOS SHEET CLADDING TO STEEL SPINE
STEEL EAVES
STEEL CHANNEL LATTICE BEHIND GLAZING
ANGLE RAIL
18 G ALUMINIUM VERTICAL CORNER PIECE
STANDARD EXTRUDED ALUMINIUM JAMBS AGAINST BRICKWORK
7" X 4" R.S.C STANCHION
VERTICAL LEG OF ANGLE RAIL IN ELEVATION
A
A
NORTH WEST ELEVATION
SCALE. 1/16" TO 1 FT.
SPACE FRAME
LEAD WING
4½" WALL
STANDARD STORM CLIP
CEMENT
1/2 F.S. DETAIL AT A-A
GLASS FINISHES 1/4" FROM TOP OF UPPER 17"x 4" R.S.C THROUGHOUT THIS MEANS GLASS WILL BE STEPPED - CUT SQUARE AT TOP HORIZONTALLY, NOT TO RAKE
VENTILATING SPACE AT CEILING LEVEL (50 FT ABOVE FLOOR LEVEL)
STEEL DECKING
WINDOW CLEANING TRACK
B
7'-1"
7'-3"
17" X 4" R.S.C.
1½" x 3/8" FLAT BATTENS A SINGLE HOLE 7/16" DRILLED ON ℄ BAR FOR BAR BOLT
POSITION OF BAR BOLT
STANDARD WEDGE & BRACKET
5/8" BOLT & PACKING PLATE
7'-6"
C
7'-6"
5" X 4" X 3/8" ANGLE RAIL
STANDARD WEDGE & BRACKET SINGLE 5/16" BOLT
DIAGONALS 3"X 1½" CHANNELS BOXED TOE TO TOE
7'-6"
GLASS
D
STANDARD FLAT ALUMINIUM PACKING
17" X 4" R.S.C. BEAM
SPACE FRAME HIP END
STANDARD BRACKET FIXED TO GLASS STOP TO HOLD GLAZING BAR
FLAT PLATE AT GLAZING BAR CENTRES RUSTPROOFED BOLTED TO 17" X 4" R.S.C. BEAM
INSULATED SHEET ROOFING
17" X 4" R.S.C BEAM
ALUMINIUM SHEET DRAUGHT FILLET
BITUMEN FELT FLASHING
PRESSED STEEL DECK UNIT
GLASS STOP HELD BY BOLT
GLAZING BAR OF SPACE FRAME NOTCHED AT VERTICAL GLASS
1/4 F.S DETAILS B, C, D
SECTION THROUGH NORTH WEST WALL SCALE 3/4" TO 1 FT



END WINDOW, FACTORY AT DUXFORD

ARCHITECTS: OVE, ARUP & PARTNERS

NEWS of the BUILDING INDUSTRY

INTEREST

THE CORRECT USE OF MATERIALS—timber in particular was the theme underlying the lecture given to a public audience by Mr. Phillip O. Reece, Director of the Timber Development Association, at the Imperial Forestry Institute, Oxford, on Tuesday, March 6.

Dealing with the structural uses of timber, Mr. Reece devoted much of his talk to defining those particular uses in structural engineering for which timber is more suited than other materials. He showed that the chief structural virtue of timber lay in its stiffness per unit of weight, a point of great importance in modern structural engineering, and showed how this was due to the evolution of wood tissue in the growing tree, a factor which also accounted for the marked ability of timber to withstand high stresses for short periods of time.

He also demonstrated how methods of connection and assembly are of greater importance to the comparatively light structures of modern times than they were to the more massive structures of the past, and dealt with modern developments in this technique as applied to timber. His examples ranged from yachts, aircraft, and wireless towers, to the heavier kinds of structure represented by light industrial buildings and bridges.

Further application to school and agricultural buildings was foreshadowed for laminated timber as used for the Waterloo Entrance to the Festival of Britain site, in the belief that the demands which will now be made on materials such as steel and non-ferrous metals will permit a more rapid development of this kind of timber construction.

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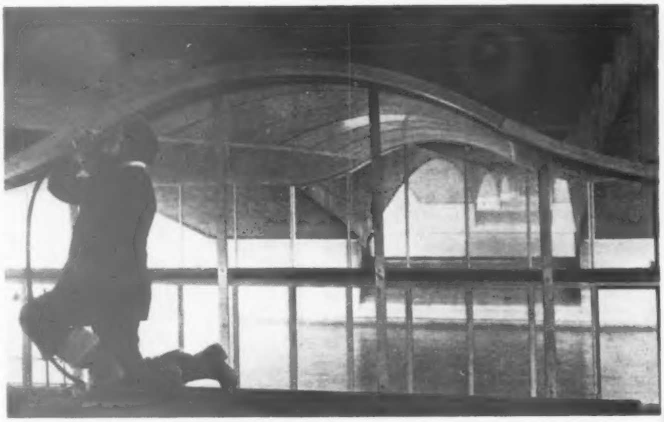

ALUMINIUM-CORK SANDWICH

Jane Drew A.R.I.B.A., architect of the Riverside restaurant at the South Bank Site of the Festival of Britain has employed a new roofing material. A section of the roof of the restaurant is shown in the illustration above. In this application the sheets are curved but flat sheets for curtain walling in steel framed buildings are also in production.
The basic construction of the panels comprises two layers of aluminium bonded to a 2 in. pure baked cork slab. The weight of the material is 2.25 lb. per sq. ft. Thermal insulation properties are said to be .14 B.Th.U.'s/sq. ft./hour/°F. The sandwich is manufactured by Messrs. Alphamin Ltd. Further details will appear in forthcoming issues of the A. & B.N.

THE GUARANTEED WEEK, higher rates, incentive schemes, increased welfare facilities, holidays-with-pay and all the amenities now common to our industry ensure that a youth who decides to make building his career can gain a very decent living, comparable with that in any other industry, said Sir Harry Selley, President of the F.M.B. on March 16.

Sir Harry appealed firstly to master builders to train the young craftsmen. Every firm, he said, should have its full quota of apprentices, for without young men coming into the industry and receiving appropriate practical training, the building industry, as we know it, would perish. To those about to leave school Sir Harry said that apart from the material advantages to be gained from working in the building industry, there was a great team spirit among the men on the site, and the variety of jobs to be done ensured that repetitive boredom does not occur.

To the union leaders the President said "Apprenticeship is a very personal relationship between employer and apprentice. Despite the great facilities being created in the technical schools up and down the country, there is no substitute for the training to be got on building sites. I would appeal to these trade unions leaders not to obstruct the agreements between the employer and his apprentices with conditions and regulations that make the employer loath to take on fresh young men.

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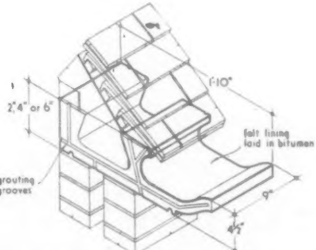

PRECAST CONCRETE GUTTER.

A detail of the patent prefabricated guttering which was specified by the winners of the Builder £1000 house competition.

MORE APPRENTICES must be recruited into the industry or a crippling shortage of competent operatives may result. This is the view of Mr. Stephen Hudson, President of the National Federation of Building Trades Employers.

Mr. Hudson, speaking at the annual general meeting of the Nottingham and District Association of Building Trades Employers said that, while he did not take such a gloomy view as some who base their conclusions on statistics, the recruitment campaign had been falling off.

The President appealed to all members of the Federation to put recruitment and training high on their list of priorities. He was sure that the industry could do the job without interference from Government or local authorities.

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MOSAICS

Mosaics, not published in this issue, will reappear in *The Architect and Building News*, April 6, 1951.

INDUSTRIAL PROBLEMS ARISING FROM THE REARMAMENT PROGRAMME were the subject of a question in the House of Commons when Mr. George A. Parjiter asked the Minister of Supply whether steps had been taken to deal with such problems.

Mr. George Strauss replied that he had secured the services of Mr. S. W. Rawson, Managing Director of John Brown, Ltd., Mr. George Briggs, assistant Managing Director of Tube Investments, Ltd., and Mr. W. C. Puckey, Director of Hoover, Ltd.

The Minister was considering further appointments of similar nature.

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THE COLLEGE OF TECHNOLOGY at Manchester offers six Scholarships and six Exhibitions varying in value up to a maximum of £65 plus approved fees if resident at home, and £140 plus approved fees if resident in hostel or lodgings, according to the financial family circumstances of the student, to Part-time Students and Others tenable in any one of the Full-time Day Courses of the Municipal College of Technology for three academic years, on condition that persons holding these Scholarships prepare themselves for the Degree of Bachelor of Technical Science (B.Sc.Tech).

Forms of application may be obtained from the Registrar of the College of Technology, Manchester, 1.

Completed forms of application must be forwarded so as to reach the Registrar, not later than June 1.

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SEALOCRETE PRODUCTS LIMITED, who have had their Registered Offices and Works at Atlantic Works, Macbeth Street,

(*continued on page 377*)

GOOD, BAD OR INDIFFERENT?

No. 29—By A. FOREMAN

Noises in Buildings No. 3.

LAST week these Notes considered sound transmission through floors which applied in keeping one flat isolated from another or bedroom floors isolated from ground floors. A further troublesome source of noise has been the transmission through walls between adjoining buildings especially in terrace and semi-detached houses, as mentioned the previous week. While much may be achieved by planning so that entrance halls and staircases act as a buffer between living rooms in two adjoining houses, it can never be more than partially successful.

Undoubtedly the most satisfactory solution is to build a dividing wall properly designed to reduce sound transmission. If such a wall is to be of solid construction its dimension would have to be of quite uneconomic thickness and therefore cavity construction should be adopted. Until recent years local authorities were unwilling to accept cavity construction for party walls but I think in most areas the authorities are now satisfied that this form of building is not only safe structurally and as a fire protection but it is a desirable necessity to aid the reduction of noise between buildings.

The construction of a cavity party wall is generally similar to cavity external walls but special care is needed to avoid defeating their aims. Firstly the wall ties should be of the "Butterfly" wire type as B.S.1243 Type B. which conduct less sound and vibration than the normal twisted galvanized steel bar type. This type of wire wall tie looks very light but if they are made of 10 gauge wire zinc coated with as heavy a covering as can be put on steel wire, which is about 1 oz. per sq. ft. of the wire surface, they should last a very long time as they should remain fairly dry. It is probably wise to use ties about 8 in. long which allows about 3 in. in each leaf to give a good hold in the mortar. The extra cost of a cavity party wall compared with a 9 in. solid wall is not very great and is small compared with the advantages gained.

Cavities must be continuous vertically from the foundations to at least one course above the uppermost ceiling and horizontally from back to front and right through any chimney stacks. Every possible precaution must be taken to separate the inner leaf of each house from the external leaf of outside walling and also from any foundation, surface concrete or floors in the two adjoining buildings. There should be built into the foundation concrete a vertical strip of bitumen felt d.p.c. placed centrally under the cavity of the wall above so that the foundation itself is in two parts. Each leaf of the party wall should be cut off from the foundation by bedding the first course on similar bitumen felt which serves also as the d.p.c. to the wall against rising dampness. Above the ceiling of the uppermost floor the cavity may be stopped and the wall solid up to the underside of the roof but again bitumen felt should be laid on the top courses of the cavity construction before the solid work starts; that part of this insulation course which forms part of a chimney stack should be made of asbestos felt or asbestos millboard to eliminate the fire risk.

Great care should be taken at openings in external walls to avoid direct contact between inner and outer leaves of external walls as this may transmit sound from inside to outside and then along the outside into the next house. Lintels over openings should be made in two parts and separated by the d.p.c. needed over each opening to prevent direct transmission. Similarly on the vertical sides of openings the inner and outer leaves should be separated with strips of bitumen felt which act also as a vertical d.p.c., or the cavity may be closed by the window frame or metal sub-frame above.

It is most desirable that floor joists are not carried on the party wall so that they do not conduct into the wall itself; when the party walls are thin or built in two thin leaves as a cavity wall the byelaws will generally not permit of the joists being placed in the thickness of party walls owing to the risk of fire being carried through the wall. So joists parallel to the front and back walls should be fixed with metal hangers.

The thickness of the leaves of the cavity party walls should be either 4½ in. brickwork or 4 in. concrete blocks, but it has been suggested by B.R.S. that they might be reduced to 3 in. concrete blocks if they carry no load at all, other than their own weight. For most normal two storey houses I think the 4 in. concrete blocks are the best solution as these can be made of light weight aggregates, which helps the reduction of sound transmission; light weight aggregate blocks may be used for the inner leaf of the external walls also so that a similar plastering surface is available on all walls. The cavities should be about 2 in. wide. I doubt very much if it is worth filling cavities in party walls with additional absorbent material such as quilts as the probable increase in sound reduction is so small and they are likely to be a nuisance to build into place owing to the wall ties.

By the way do not run away with the idea that normal hollow clay or concrete blocks or walls built of cavity bricks can replace proper cavity construction as a sound reducing construction because they will not; they are no better than a solid wall of the same thickness as the webs between the faces conduct the sound in the same way.

THE PRINCIPLES OF STRUCTURAL WELDING

No. 4.—By Rolt Hammond, A.C.G.I., A.M.I.C.E.

In the previous article the author described the welding system of the Arcon house roof truss.

FINAL INSPECTION

The final and perhaps the most important operation was the checking jig, and final inspection. This jig was designed to receive the entire truss and in one setting to give complete verification that all holes were in correct position. Pins used for checking were the correct bolt size, and since these were five thousandths of an inch less than the hole size, the amount of misalignment allowable was very slight. However, experience proved that if the subsidiary operations were carried out with the required accuracy, no great difficulty was experienced in making the truss to within the necessary limits of accuracy.

Fig. 5 shows two other designs, a Vierendeel truss and a Murex type of purlin. Both are very simple, and can be made by any concern equipped with simple and relatively inexpensive plant.

Vierendeel girders with spans varying

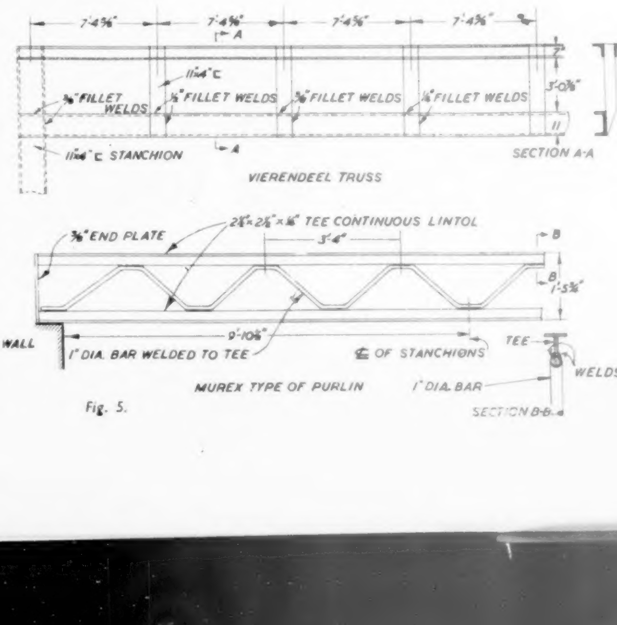

Fig. 5.

from 42 feet 3 in. to 57 feet have been used in place of normal type of lattice girders in cases where the latter would have interfered with architectural treatment and feurstration. This type of truss is ideal for the accommodation of glazed metal casements in the rectangular openings of the truss.

The Murex type purlin, for continuous lintels supporting the roof above side wall windows has a load carrying capacity considerably greater than the normal rolled section type, having the same weight per foot run, owing to the increased depth. Moreover, the welded joints are very simple and a very small number of components is used. Such girders are eminently suitable for mass production methods, the use of short straight welds contributing to economy of fabrication. From a load carrying point of view there is a great advantage in having a design in which the eccentricity at the joints has been reduced to a minimum.

Another example, built during the last war when economy of steel was a vital factor, has roof trusses with a span of 36 feet $1\frac{1}{2}$ inches carried on brick walls. The trusses are fabricated from $1\frac{3}{4}$ by $\frac{3}{8}$ in. angles for the web strut members and of $1\frac{1}{4}$ by $1\frac{1}{4}$ by $\frac{1}{8}$ inch angles for the web ties. The weight of each truss, including purlin plates and shoe details is only 4 cwts. while that of the weld metal is only $2\frac{1}{4}$ lb. per truss. The use of all-welded trusses in this case has resulted in a saving of 33 per cent. in the steel used. It is now about thirteen years since the examples quoted were put into service and a careful survey of maintenance costs over this period has shown that the use of welding in the structural field results in considerable economy of upkeep.

To obtain the full advantages of welded construction, the structure must be designed and supervised during fabrication by welding experts. A good example of this is provided by the Diagrid form of construction. The monolithic grids used in this method rely entirely upon the properties of welded connections; in other words, these grids are all-welded and cannot be fabricated with riveted connections, complete continuity being a basic requirement of the design. Such grids can be arranged in almost any size or shape and can be adapted to plane or to spatial structures.

The most important result of arc welding when applied to steel structures is to produce a monolithic action between the various members which are connected together. The continuity thus obtained is a great asset from the economic standpoint, as it tends to reduce moments and forces acting on the component parts of a load-bearing structural system, but on the other hand it leads to a structure which can be designed only by the use of somewhat complex methods of stress analysis.

The main objective of the Diagrid design has been to standardize each connection, whether for flat grids or for arched north-light or ordinary pitched grids. Thus, the ridge and valley line connections for each of the latter cases vary only in the angle between the two slopes or grid planes connected. This standardization is particularly economical in drawing office costs, as connection detailed drawings can be produced very rapidly, besides leading to considerable savings in fabrication and erection costs. All grid beams are spliced with butt welds, as are most long members made up from stock lengths.

A typical example of the application of this system of construction is a factory at Bristol, where the structure consists of a row of square floor panels, comprising eight panels each 22 feet 6 inches square and ten panels 20 feet square, supported on two rows of precast concrete columns of 8 inches by 8 inches cross section and spaced at 22 feet 6 inches and 20 feet centres respectively. The grids were considered continuous in one direction and were designed for a superimposed load of 100 lb. per sq. foot. The flooring material consists of a reinforced concrete slab haunched down to the lower flanges of the $4\frac{3}{4}$ by $1\frac{3}{4}$ inches by 6.5 lb. per foot rolled steel joist grid beams, the corners being filled with concrete to the full depth of the grid beams.

In the Ice Rink at Blackpool, the structure consists of single pitch roof of 133 feet span with one semi-circular end covered by a half cone. The longer dimension in plan is 150 feet and there are no internal supports of any kind. Along the boundaries at eaves level the structure is supported on concrete columns and in the centre the apex of the half-cone provides virtual support for one end of the pitched grid along the ridge. The roof covering consists of asbestos cement sheeting on timber boarding, and there are in addition a number of heavy concentrated loads suspended from the roof structure to carry the lighting equipment. The roof slope in the grid portion is $22\frac{1}{2}$ degrees. For this building a model was constructed to investigate the distribution of stress in the roof of the structure erected at Blackpool, the scale of the model being 1 in 33.3 in plan. The actual grid members in the model were 1 inch by $\frac{3}{16}$ inch flats with subsidiary tie members of $\frac{1}{8}$ in. by $\frac{1}{8}$ in. flats, the connecting welds having been designed to develop the full strength of the members. It was not possible to test the model in the testing machine available owing to the cumbersome shape, so it was decided to apply dead loads; point of application was at the main ridge detail and also at points in the centre of the grid beams in the slopes. Load was transmitted to all points of support as in the structure itself, packing plates of varying thickness being placed at the eaves nodes to give equal bearing. Deflection readings were taken under the point of application of the load with an Ames' dial, and strain readings in grid members were also taken with the Huggenberger strain meter. Stress figures obtained from strain readings showed remarkable conformity with those calculated.

Experimental research has been carried out on welded diagonal grids at the City and Guilds College under the supervision of Professor A. J. Sutton Pippard, M.I.C.E. In all the three models the grid beams were flats of $1\frac{1}{4}$ in. by $\frac{1}{4}$ in., excepting the corner beams which were made from 2 in. by $\frac{1}{4}$ in. flats. The edge beams were 2 in. by $\frac{1}{2}$ in. flats in all three models. Among other things, the tests have proved the theoretical reasoning that the presence of bottom corner slabs increases the torsional rigidity of the corner beams and reduces the deflections and moments in the centre of the panel. The calculated deflection and positive moment values were, in every case, greater than those obtained in the tests, thus demonstrating the conservative character of method of grid stress analysis and the additional margin of safety provided by welded diagonal grids.

In his next article Mr. Hammond discusses the advantages of stud welding. This system, recently demonstrated in London, has been used for fixing wall sheets and roofing at the Festival of Britain in the Industry Pavilion.

INTEREST *(continued from page 375)*

London W.6. for many years, have moved their Offices and Works, to Atlantic Works, Hythe Road, Willesden, London N.W.10, as from March 19, 1951. The new telephone number is LADbroke 0015-6-7, their telegraphic and cable address will remain as before, namely—EXPLOITURE, LONDON.

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THE ALUMINIUM DEVELOPMENT ASSOCIATION has just issued a new booklet on the history, geographical location and production of aluminium and its alloys. For those interested in the background of a material which has many building uses this is an interesting "nutshell" account.

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THE BRITISH WELDING RESEARCH ASSOCIATION is to hold a Summer School on "Welding Design and Engineering," at Ashorne Hill, near Leamington Spa, Warwickshire, from Friday, May 25 to Saturday, June 2, 1951 inclusive. The aims of which are to acquaint the practical man with up-to-date welding developments: to stimulate the application in industry of experimental knowledge and experience and to describe the present state of knowledge relating to some of the fundamental welding problems.

There will be five and a half days devoted to general lectures on Welded Structures under Fatigue Loading; the Problem of Brittle Fracture and Residual Stresses in Welded Structures, etc.

Employers who wish to send members of their staff to the school, or individuals who wish to attend, should communicate with the Secretary, British Welding Research Association, 29, Park Crescent, London, W.1.

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A NEW GAS COOKER was exhibited in London on March 15. The cooker is in the luxury class and was designed by Raymond Loewy. One of many new features incorporated in the "Raymond" cooker is the method of gas ignition which is illustrated in the accompanying photograph. To light any burner the appropriate knob is pressed and turned and the end knob is then pressed to give ignition. A safety device on the oven ensures that the oven burner cannot be ignited until the door has been opened. Further details of this cooker will be published in "Mosaics."

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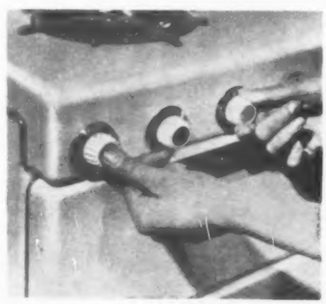


See "a new gas cooker" above

HEATING RESEARCH IN OCCUPIED HOUSES

By J. C. Weston, Ph.D., A.M.I.H.V.E.

SYNOPSIS.

The research work in twenty occupied houses at Abbots Langley from May, 1948, to May, 1950, is presented and discussed. The house temperatures, thermal input and costs are given and system efficiencies deduced. Notes for the guidance of the designers of housing are given in conclusion.

IN a paper read to the Institution of Heating and Ventilating Engineers on March 14, Dr. J. C. Weston of the Building Research Station reviewed the heating research work which has been carried out in twenty occupied houses at Abbots Langley by the B.R.S. These twenty houses (ten semi-detached pairs) were primarily designed for the study of heating systems and are all insulated to U valves of about .20 B.T.U. per sq. foot per hour °F.

In this the Abbots Langley Houses differ from the first group of experimental houses which were built at Bucknalls Close and which are also referred to in this paper.

The tenants in the houses now under discussion have been moved from house to house at intervals of about one year and by 1952 each house will have had four tenants.

This paper draws important conclusions without attempting a detailed comparative analysis which would be premature at this stage of the continuing experiment.

Extracts from Dr. Weston's paper follow.

Measurements.

During the occupied period, the air temperatures of all rooms of all the houses are recorded continuously at a height of 5 ft. above the floor and at a position chosen to be representative of the temperature of the whole room. The outside climate; temperature, wind speed and sunshine is also recorded.

The weekly consumption of gas, electricity and solid fuel is obtained by housing managers, who have general responsibility for the houses and for obtaining the reactions of the tenants at intervals. The tenants pay for their fuel weekly at rates which are typical of those current in the London Region.

The room temperatures and fuel-consumption data form the basic information, but for subsequent analysis a knowledge of ventilation rates is required. This was obtained partly from investigations when the houses were unoccupied, and partly by measurements during the occupied period. To supplement these measurements, observations of the window-opening habits of the individual households are made regularly throughout the winter. All this data together enables the ventilation heat-loss to be deduced.

Temperatures

The seasonal mean temperatures, room-by-room, for the twenty houses for the thirty-three weeks from approximately October 1 to May 19 are given in the Table, together with the mean house temperatures. The mean house temperature is the arithmetic mean of all the rooms, with the living-room included twice to allow for its greater size and/or ventilation rate. . . The error in house mean arising from this estimation is unlikely to exceed 0.2° F. Slight differences will be found between the "house mean" values in the Table and those computed directly from the individual room values, since the values of house means are derived directly from the weekly house means and there are inevitably slight "rounding off" errors.

House Mean Temperatures

Confining attention for the moment to the "house mean" temperatures it will be seen that there is a wide range (53.9° F. to 61.3° F. in 1948-49 and 53.5° F. to 63.5° F. in 1949-50), and also that there are large differences between the same house in the two years due to the different requirements of individual households. The overall picture has, however, changed little between the two years, the "site mean" being 57.8° F. and 58.3° F. with corresponding temperature differences between inside and outside of 13.3° F. and 12.9° F. An investigation of the temperature in over 200 local authority houses during the winter of 1949-50 showed that, in houses insulated to the same degree as the experimental houses, the mean house temperature difference was 12.9° F. It seems reasonable to conclude that the temperatures of the houses at Abbots Langley are not unrepresentative of the majority of such houses.

The mean house temperature is not, of course, by any means constant from week to week, but decreases with decreasing outside temperature. There are a number of reasons for this. Since the heating of houses in this country is usually intermittent, the temperature in the "unheated" period will decrease with outside temperature. Also the appliances installed have only a limited output and at a certain level of outside temperature the appliance will be unable to provide the required output; any further fall in outside temperature will cause a corresponding drop inside. Finally, and possibly the most important cause, is that the tenants may be unable or unwilling to increase their expenditure to the extent required to maintain constant temperature inside in the face of a falling outside temperature. From a graph used to illustrate the paper it has been shown that the weekly mean inside temperature falls about 0.5° F. for each degree drop of outside temperature and there is little difference between the data derived from the two years. The dependence of inside temperature on tenant requirements is illustrated by the two lines in another graph which gives the data for house 22 with, of course, two different families in the two years. The general level of temperature is about 4° F. lower in 1949-50 than in the previous year, and the slope of the line is over 0.7° F. per °F. as against 0.5° F. per °F. in the previous year. It should not be assumed, however, that the temperatures maintained by a particular family are necessarily the same in different houses. While there is "some degree of consistency in the patterns of human behaviour", the heating system also exercises a marked effect. The second graph shows the results for one tenant in two houses. In 1948-49 this family occupied a house having a pre-war open fire in the living-room and a

Winter 1948-9

House No.	9	10	11	12	13	14	15	16	17	18	19	20	21	22	31	32	33	34	35	36
Living-Room (1) ..	60.7	59.1	60.1	58.9	61.6	61.1	59.5	59.8	60.2	57.0		60.0	55.7	62.4	61.2	58.6	58.1	57.7	53.8	53.8
Dining Space (2) ..	62.0	57.7	61.4	67.4	67.5	63.9	64.2	64.6	58.7	64.2		64.0	56.0	60.9	60.3	57.1	62.1	56.4	64.7	60.6
Kitchen (3)	63.6	58.3	63.6	68.9	69.3	64.3	65.8	64.3	59.0	67.0		66.9	58.2	63.1	57.0	55.1	63.8	58.6	58.7	56.8
Hall	57.0	53.6	54.7	54.4	57.4	56.1	59.4	56.9	56.2	57.8		55.0	54.1	59.1	53.0	56.2	53.5	53.9	48.5	47.7
Landing	57.7	56.3	56.5	52.6	58.9	58.9	59.4	58.7	58.8	60.0		56.6	56.8	61.1	55.8	56.2	56.9	58.0	50.5	49.6
Bedroom 1	58.8	55.4	55.6	52.8	56.8	58.6	56.9	58.4	61.8	56.9	EMPTY	54.8	53.3	57.0	59.5	56.8	57.0	53.3	55.5	55.2
Bedroom 2	59.1	53.7	56.6	53.9	58.0	58.2	55.0	58.8	62.8	58.0		55.2	53.9	57.6	58.7	55.6	56.6	54.4	53.7	53.4
Bedroom 3	57.7	53.5	55.5	54.2	58.4	60.4	54.9	59.0	58.7	57.3		54.1	49.2	54.3	53.2	51.3	56.1	50.4	51.9	51.3
Bathroom	59.7	54.7	55.9	54.4	62.9	62.0	61.1	61.0	58.8	60.9		54.7	53.6	58.6	53.2	56.2	58.6	56.0	48.6	49.6
House Mean (4) ..	59.8	55.9	58.0	57.9	61.3	60.5	59.5	60.1	59.6	59.5		58.1	54.8	59.7	57.2	56.0	58.0	55.6	55.1	53.9

Outside Temperature—44.5° F.
Windspeed—8.2 m.p.h.

Winter 1949-50

House No.	9	10	11	12	13	14	15	16	17	18	19	20	21	22	31	32	33	34	35	36
Living-Room (1) ..	61.7	59.0	60.1	59.6	61.7	64.8	64.1	64.8	62.1		66.0	59.6	57.3	60.0	65.6	55.7	58.3	57.7	53.7	52.6
Dining Space (2) ..	58.0	59.8	60.5	63.3	63.9	65.8	69.8	69.8	58.4		65.1	64.8	56.1	58.0	65.3	56.5	62.0	54.3	59.0	60.7
Kitchen (3)	60.0	59.2	63.2	63.9	66.1	66.7	71.6	68.4	58.0		66.3	67.4	58.4	57.9	58.8	55.6	63.9	56.5	55.7	58.2
Hall	54.3	52.5	56.2	55.8	61.6	59.6	58.0	64.2	52.6		58.2	56.3	54.3	53.9	53.5	55.2	53.0	53.5	48.7	48.6
Landing	55.4	54.9	58.9	56.6	64.6	61.3	58.6	62.7	59.1		59.8	56.9	57.1	56.8	56.2	55.4	54.0	56.0	50.3	49.4
Bedroom 1	56.4	54.2	57.3	56.2	61.7	62.7	58.1	59.3	58.9	EMPTY	57.6	56.3	53.4	53.9	57.9	54.1	52.5	53.5	54.7	54.9
Bedroom 2	55.6	53.4	60.1	56.6	64.1	62.4	58.5	59.1	59.6		56.8	55.9	54.2	54.5	58.5	54.8	52.3	52.0	53.2	53.0
Bedroom 3	53.3	53.0	56.1	54.2	62.3	61.0	58.7	59.0	58.1		54.6	55.4	51.6	50.8	53.7	50.6	50.7	50.8	52.0	50.7
Bathroom	57.7	54.1	56.8	57.2	63.1	61.4	58.0	62.7	54.9		58.7	54.6	54.5	54.6	53.7	55.4	54.2	54.8	48.7	49.8
House Mean (4) ..	57.4	55.9	59.0	58.3	63.1	63.0	61.9	63.5	58.4		60.9	58.7	55.4	56.1	58.9	54.9	55.7	54.6	53.5	53.9

Outside Temperature—45.4° F.
Windspeed—8.5 m.p.h.

NOTES: (1) Parlour in 31, 32, 35 and 36. (2) Kitchen-living-room in 31, 32, 35 and 36. (3) Scullery in 31, 32, 35 and 36. (4) Mean of all rooms, living-room included twice except in 31 and 32, where parlours are included twice, and 35 and 36 where kitchen-living-room is included twice.

domestic boiler in the kitchen, while in the following year they had full central heating. The extent to which the higher temperatures with the latter reflect the ability of this system to give a higher service on the one hand, or the extent to which, lacking a radiant source, the tenant is forced to run to a higher temperature, remains an interesting field for speculation and controversy. Certainly, in this particular case, the tenant did not regard the centrally heated house as any more "comfortable" than the earlier one; the living-room, in fact, being thought less comfortable than that of the previous house.

Cost of Fuel and House Temperatures

The importance of thermal habits and the ability and/or willingness of the tenant to pay for fuel has already been indicated, but it is brought out strikingly by results obtained in the houses at Bucknalls Close. In 1946-47 the tenants received a subsidy amounting to about $\frac{2}{3}$ of their fuel bills. In 1947-48 the subsidy was reduced to $\frac{1}{2}$, and in 1948-49 it was removed altogether. In 1949-50 a 25 per cent. subsidy was given on solid fuel only. The consistent fall of temperature within the houses as the subsidy was removed and the subsequent rise with the slight subsidy in the last year is noticeable. It should perhaps be emphasized that although the occupants accepted lower temperatures, as the price of fuel was increased there was also a substantial increase in expenditure. In 1948-9 the expenditure was, in fact, about twice that in 1946-47, while the fuel prices had increased about threefold. This same characteristic of falling inside temperatures with increase in the cost of heating is also shown individually by seven out of the eight households, and there are sound reasons for this not being the case in the eighth house. While the actual magnitude of the drop of temperature with increasing cost will depend on individual circumstances there can be little doubt that such an effect will be general and applicable to the great majority of occupants of small houses.

The remaining headings (dealt with fully in Dr. Watson's paper are summarized in the following conclusions.

Conclusions

The conclusions from this type of work are of two kinds. Firstly, there are the technical matters of interest to designers of appliances and heating systems and to those concerned with policy. Such items as the variation of inside temperature with that outside, the level of thermal input, weekly expenditure on heating, ventilation rates, and so on, fall within this category and have been indicated within the body of the paper, but have been summarized below for convenience.

Technical Conclusions

(1) *Temperatures.* The variation of house temperatures with the cost of heating and the economic circumstances of tenants and the fact that inside temperatures are not constant, but fall with decreasing outside temperature in a consistent manner, is clearly demonstrated by these results. It is shown that broadly speaking, in these houses, the mean temperature falls 0.5° F. for each 1° F. drop of outside temperature. In living-rooms the fall is not so marked; being 0.4° F. for the weekly mean and only 0.25° F. during the evening.

In houses of traditional construction the seasonal mean living-room temperature is likely to be about 60° F.

The evening temperatures suggest that the comfortable air temperature for sitting is over 65° F. and is probably nearer 70° F. There is evidence, as yet inconclusive, that the air temperatures in living-rooms where the heating is mainly convective (e.g. radiators) are run at higher temperatures than living-rooms with some source of radiant heat.

Bedroom temperatures, even in nominally "unheated" bedrooms, are shown in these well-insulated houses (U around 0.20 B.T.U. per sq. ft. hr. °F.) rarely to be unduly low. The results emphasize the importance of providing adequate heating in downstairs rooms, particularly living-room and kitchen, before making special provision for background heating of bedrooms and also showed the value of thermal insulation in increasing comfort.

(2) *Thermal Input.* The observed range of annual thermal input is wide, but over half are less than 1,050 therms; low summer consumption being associated with the provision of gas or electric appliances for water heating. The coal equivalent thermal input figures confirm that in a well-insulated house 3-3½ tons of raw coal will give only a minimum service, while 3½-4 tons are adequate to provide average conditions.

The variation of input week by week is not as great as might be expected, being 15 therms per week at the end of the heating season and 35 therms in "32° F weather". This shows that the "degree-day" method of computing heat requirements is unsuitable for dealing with dwellings, where, as is usually the case, the economic circumstances of the tenants and their personal preferences play an important part. The effect of solar-heat gain in reducing heat requirements at the end of the heating season is noted.

(3) *Cooking.* 18 kW of electricity are shown to be equivalent to 1 therm of gas for cooking in these particular houses, when allowance is made for water heating carried out on electric kettles apart from the cooker. The consumption of lightly-insulated free-standing cookers or combination grates used continuously is about 200 lb. of coke per week.

(4) *Bedroom Topping-up.* The consumption of fuel for this purpose was generally small; being often less than 5 therms during the heating season.

(5) *Expenditure.* Annual expenditure for all heating services ranges (with one exception) from £23-£36. A 10° F. drop in weekly outside temperature raises the weekly expenditure in this group of houses by 3s. 4d.; the range of expenditure between mild and cold weather is small (8s.-18s.).

The annual average weekly expenditure for water heating and space heating only is often less than 7s. 9d. per week (50 per cent. of cases) and generally (90 per cent.) less than 9s. 6d. The desirable objective for district heating would therefore appear to be a weekly charge of less than 9s. and preferably less than 8s.

(6) *Ventilation.* Ventilation rates are commonly in the range 1.75 to 3.25 changes per hour and the "cost of ventilation" is around 5s. per week.

(7) *System Efficiency.* Many heating methods have efficiencies in the range of 50 to 65 per cent. when allowance is made for fortuitous heat gained by convection from the surround of the fire and from the flue.

Apart from these detailed technical conclusions there are the more general matters which are of interest to architects and housing committees, and are in answer to the question "What advice can be given on the design of houses of around 1,000 sq. ft. for a local authority?" Final recommendations must await the completion of the research, but on some matters of heating and house design definite advice can already be given and the following points based not only on the present paper, but also on the general programme of heating research in houses at Building Research Station are presented for guidance in the immediate future.

(1) *Construction.* The house should be insulated to U values between 0.20 to 0.25 B.T.U. per sq. ft. hr. °F. This may be achieved for the walls by an unventilated cavity construction with a brick outer leaf and light-weight concrete (such as foamed slag or clinker) for the inner leaf. These constructions are little, if anything, more expensive than 11 in. cavity brickwork ($U = 0.30$).

U values in the required range for the ground floor are achieved by a solid floor laid on the ground or, where necessary, over hard-core. The floor finish has only a slight effect on the U values.

The pitched roof with tiles or slates on battens with roofing felt over the rafters requires additional insulation to achieve U values in the range 0.20 to 0.25, and this may be provided by adding a material such as glass silk, slag wool or aluminium foil laid over, or preferably between, the ceiling joists.

(2) *Windows and Doors.* The windows and doors should fit as well as possible and external doors should be weather-stripped.

(3) *Flues.* No flues should be on an external wall.

(4) *Space Heating.* The main space and water heating load in winter should be taken by a single solid-fuel appliance in localities where gas or electricity is available for cooking. The solid-fuel appliance may be some version of continuous burning open fire with back boiler, or inset or free-standing stove with boiler. The back boiler should preferably be of sufficient size to provide both domestic hot-water supply and heat about 30 sq. ft. of radiator surface, and the radiators should be placed in downstairs rooms, such as a kitchen or dining space. If the boiler is not of sufficient size to heat adequate radiator surface then the appliance should provide convected warm air, and this should be supplied to the room in which the appliance is situated or to an adjacent downstairs room, rather than to bedrooms on the upper floor. In one bedroom, at least, facilities should be provided for the use of either gas or electric fires, or where these fuels are not available an additional solid-fuel appliance should be provided.

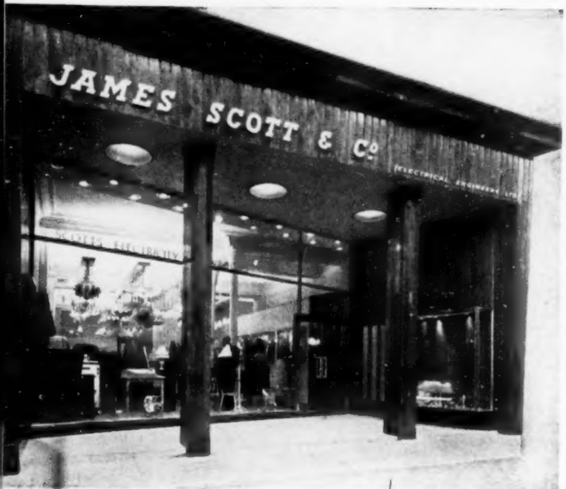
(5) *Water Heating.* Electric immersion heaters or gas multi-point heaters or circulators are desirable additions for summer use. Thermostatic control is desirable for electric immersion heaters. A somewhat less satisfactory alternative is to use the living-room appliance to supply hot water for baths, and provide only a gas or electric sink heater in addition.

(6) *Insulation of Storage Tanks.* The hot-water storage tank should be lagged with 1 in. of insulation. Where the storage tank is to be used in conjunction with a gas circulator or electric immersion heater in the summer, 3 in. of insulation should be used, and a removable cover provided for the top.

If the cold-water tanks and water pipes are placed in the roof space, the ceiling insulation should be carried over the tank and no insulation should be placed immediately below it.

Water pipes should be kept away from external walls, and the whole of the plumbing layout should be as compact as possible.

(7) *Cooking.* Cooking should be done by gas or electricity where this is available. Solid-fuel cookers, preferably of the free-standing type, will be used in rural areas where gas or electricity are not available in urban areas where there is a traditional preference for cooking by solid fuel.



ELECTRICAL SHOWROOMS GLASGOW

Architect :
A. Buchanan Campbell. A.R.I.B.A.

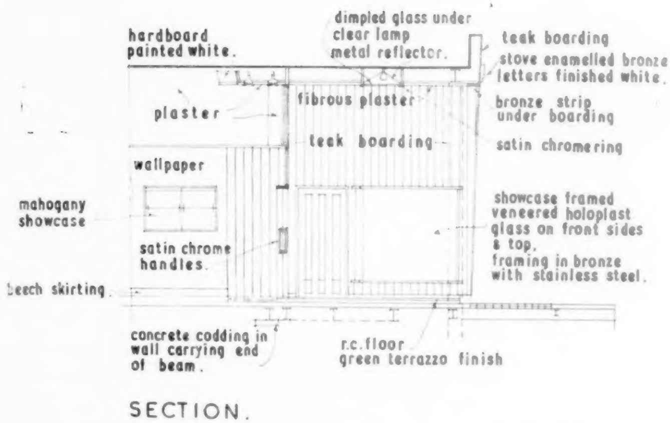
The fascia, ingoes, pillars and pilasters of these showrooms at 426 Sauchiehall Street are clad in $\frac{3}{4}$ in. teak boards, $5\frac{1}{2}$ in. wide with $\frac{1}{2}$ in. wide recess between the boards and bases of black granite. The canopy which extends 3 ft. into the showrooms is of plaster painted white with stainless steel surrounds to the lights. The main window is of $\frac{3}{8}$ in. plate glass with "Armourplate" doors.

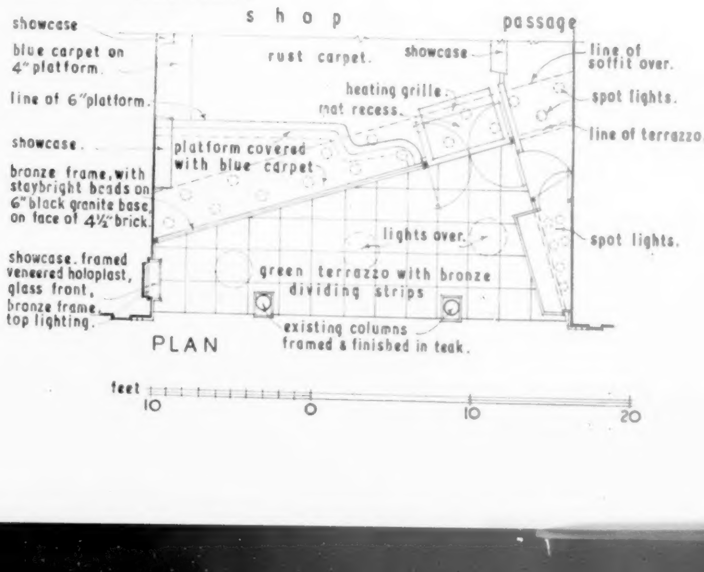
Window sashes and surrounds of the large display case are finished in bronze with stainless steel beads.

MATERIALS AND TEXTURE No. 1

Right, a section through the entrance to the showrooms showing the application of materials.

Below right, a plan of the entrance showing lighting positions.





Notes below give basic data of contracts open under locality and authority which are in bold type. References indicate: (a) type of work, (b) address for application. Where no town is stated in the address it is the same as the locality given in the heading, (c) deposit, (d) last date for application, (e) last date and time for submission of tenders. Full details of contracts marked ✱ are given in the advertisement section.

CONTRACT • NEWS •

OPEN

BUILDING

ALDRIDGE U.C. (a) 30 houses and 8 aged persons' bungalows with site works and drainage, at King's Road, Rushall. (b) Council's Clerk, The Council House. (c) 2 Gns. (e) Apr. 28.

* * *

BASINGSTOKE B.C. (a) 30 dwellings at South Ham site. (b) Borough Surveyor, Municipal Buildings. (c) 2 Gns.

* * *

BRIGHTON B.C. (a) Ambulance headquarters at Elm Grove, Brighton General Hospital. (b) Borough Engineer, 26-30 King's Road. (c) 2 Gns. (e) Apr. 10.

* * *

CHICHESTER C.C. (a) Public convenience at St. Martin's Street. (b) City Surveyor, "Greyfriars," North Street. (d) Mar. 31.

* * *

DURHAM COUNTY POLICE AUTHORITY. (a) 2 pairs of police houses at West Lea, Seaham. (b) County Architect, Court Lane. (e) Apr. 6.

* * *

EAST SUFFOLK C.C. (a) Primary school at Mellis. (b) County Architect, County Hall, Ipswich. (c) 2 Gns. (d) Apr. 6. (e) May 11.

* * *

✱GWRFAI R.D.C. (a) New Steel framed factory buildings, Pen-y-Groes, Caerns. (b) David M. Evans, Clerk of the Council, Cwellyn, Caerns. (c) 2 Gns. (d) Apr. 10. (e) Apr. 30. See page 33.

* * *

GRAVESEND B.C. (a) Rent office and flats at Sun Lane. (b) Borough Engineer, 6 Woodville Terrace. (c) 2 Gns. (e) Apr. 16.

* * *

HAYWARDS HEATH. (a) Hairdressing salon at St. Francis Hospital. (b) Messrs. Stanley Roth, Tetley & Felce, 60 West Street, Brighton. (c) 1 Gn. (e) Apr. 25.

* * *

HENLEY R.C. (a) 6 houses at Crays Pond, Goring Heath. (b) Council's Clerk, 12 Hart Street, Henley-on-Thames. (c) 3 Gns. (e) Apr. 9.

* * *

HIRAETHOG R.C. (a) 10 houses at Eglwysbach. (b) Council's Clerk, Council Offices, Avondale, Llanrwst, Denbighshire. (c) 3 Gns. (e) Apr. 9.

* * *

HAMPSHIRE POLICE AUTHORITY. (a) Police station and inspector's house at Southampton Road, Lymington. (b) A. E. O. Geens, 15 Westover Road, Bournemouth. (c) 1 Gn. (e) Apr. 24.

* * *

LANGPORT R.C. (a) Brick and concrete building for treatment plant, near new reservoir at Compton Durville. (b) Messrs. W. Herbert Bateman & Partners, Chesterfield House, Batheaston, Bath. (c) 2 Gns. (e) Apr. 23.

* * *

LONDON—LEYTON B.C. (a) Additional hutted classrooms at Cann Hall Road and Church Road Primary Schools. (b) Borough Engineer, Town Hall, E.10. (c) £2. (d) Apr. 4.

* * *

LONDON—MALDEN & COOMBE B.C. (a) 14 houses on site No. 32, Malden Way. (b) Borough Engineer, Municipal Offices, New Malden. (d) Mar. 31.

* * *

LONDON—WANDSWORTH B.C. (a) Public convenience at Gracefield Gardens. (b) Borough Engineer, Municipal Buildings. (c) £2. (e) Apr. 11.

LONDON—WANDSWORTH B.C. (a) Rebuilding Church of England Chapel and other works for reinstatement after fire damage of Putney Vale Crematorium. (b) Borough Engineer, Municipal Buildings. (c) £2. (e) May 23.

* * *

LONGBENTON U.C. (a) 14 aged persons' homes and recreation room at Front Street, Burradon. (b) Engineer and Surveyor, Council Offices, Forest Hall, Newcastle-on-Tyne. (c) 2 Gns. (e) Apr. 9.

* * *

LONGBENTON U.C. (a) 7 houses at Forest Hall. (b) Engineer and Surveyor, Council Offices, Forest Hall, Newcastle-on-Tyne. (c) 2 Gns. (e) Apr. 9.

* * *

MARCH U.C. (a) 7 aged persons' bungalows on Westwood Avenue St. Mary's Drive site. (b) W. S. Pickett, Town Hall. (c) 2 Gns. (e) Apr. 14.

* * *

N. IRELAND—ANTRIM R.C. (a) 10 houses at Gortnagallon and 10 at Diamond, Crumlin, with site works. (b) Messrs. McCarthy & Lilburn, 47 Scottish Provident Buildings, Belfast. (c) 5 Gns. (e) Apr. 11.

* * *

N. IRELAND—BELFAST C.C. (a) Sub-station building at Alliance Road, Ligoniel. (b) Messrs. Merz & McLellan, Carliol House, Newcastle-on-Tyne, 1. (c) 5 Gns. (e) Apr. 13.

* * *

N. IRELAND—DOWNPATRICK U.C. (a) 18 houses on 2 sites at Stream Street. (b) Town Surveyor, Irish Street. (c) 5 Gns. (e) Apr. 18.

* * *

N. IRELAND—HILLSBOROUGH R.C. (a) 40 houses at Saintfield, and 12 houses at Ballykeel-Artifinney. (b) Messrs Gamble & Maxwell, 5 University Terrace, Belfast. (c) 5 Gns. (e) Apr. 10.

* * *

NORFOLK E.C. (a) 3 hutted classrooms at Wroxham Primary School. (b) Chief Education Officer, County Education Offices, Stracey Road, Norwich. (c) £2. (d) Apr. 4.

* * *

NORTHAMPTON B.C. (a) 22 aged persons' bungalows at "Sunniside," Harborough Road. (b) Borough Architect, Guildhall. (c) 2 Gns. (d) Mar. 31. (e) Apr. 23.

* * *

PETERBOROUGH C.C. (a) 22 houses, 10 houses and 10 houses, 16 houses, 2 houses and 16 houses, on Eastfield Estate. (b) City Engineer, Town Hall. (c) 2 Gns. (d) Apr. 6. (e) Apr. 30.

* * *

REDCAR B.C. (a) 24 houses, 22 houses, and 16 houses, on Lakes Estate. (b) Borough Engineer, Municipal Buildings. (c) 3 Gns. (e) Apr. 17.

* * *

REDDITCH U.C. (a) 20 shops and maisonettes with site works at Batchley Estate. (b) Engineer and Surveyor, Council House. (c) £5. (e) Apr. 16.

* * *

RIPLEY U.C. (a) 9 houses, 11 houses, 14 houses, and 14 houses, on The Elms Estate. (b) Council's Surveyor, Town Hall. (c) 2 Gns. (e) Apr. 7.

* * *

SCOTLAND—MUSSELBURGH B.C. (a) 24 flatted houses at North High Street and Downie Place. (b) Burgh Surveyor, Municipal Offices, High Street. (e) Apr. 23.

* * *

SHAFTESBURY B.C. (a) 22 bungalows on Grosvenor Road Estate. (b) Town Clerk. (c) 2 Gns. (e) Apr. 9.

* * *

SOUTHEND-ON-SEA B.C. (a) Alterations, repairs and redecoration at Crowstone House, Westcliff-on-Sea. (b) Borough Engineer, Municipal Buildings. (c) £2. (e) Apr. 19.

SURREY C.C. (a) Adaptations etc. at "Bradshaigh," Gong Hill, Frensham, to form aged persons' home. (b) County Architect, County Hall, Kingston-on-Thames. (d) Apr. 3.

* * *

WAKEFIELD R.C. (a) 6 houses at Crigglestone, 12 houses at Crofton, 12 houses at Sharlston, 4 houses at Middlestown, and 6 houses at Kirkthorpe, and construction of site works. (b) Engineer and Surveyor, Wakefield. (e) Apr. 20.

* * *

WOLVERHAMPTON B.C. (a) 48 maisonettes in 8 three-storey blocks. (b) Director of Housing, Town Hall. (c) 5 Gns. (d) Apr. 2.

PLACED

Notes on contracts placed state locality and authority in bold type with (1) type of work, (2) site, (3) name of contractor and address, (4) amount of tender or estimate. † denotes that work may not start pending final acceptance, or obtaining of licence, or modification of tenders, etc.

BUILDING

DURHAM E.C. (1) Structural steelwork, concrete roof and floor units. (2) Durham New Grammar Technical School. (3) Hills (West Bromwich) Ltd., (4) £42,827.

* * *

DURHAM E.C. (1) Erection of Durham New Grammar Technical School. (3) Leslie & Co., Woodlands Road, Darlington. (4) £256,350. In place of tender withdrawn.

* * *

KESWICK. (1) Alterations and additions to premises for Northern Gas Board. (2) Otley Road, Newcastle-on-Tyne. (3) I. & R. Hodgson, Stanger Street, Keswick. Architects: Hope & Davidson, L.R.I.B.A., 21 Station Road, Keswick.

* * *

MAIDSTONE R.D.C. (1) 16 houses. (2) Bearsted. (3) L. Edwards & Sons. (4) £24,907 15s. 5d.

* * *

MAIDSTONE R.D.C. (1) 16 houses. (2) Bearsted. (3) E. W. Ballard Ltd. (4) £25,126 5s. 7d.

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MAIDSTONE R.D.C. (1) 16 houses. (2) Bearsted. (3) R. Filmer. (4) £25,348 10s. 6d.

* * *

MAIDSTONE R.D.C. (1) 16 houses. (2) Bearsted. (3) H. Godsell. (4) £25,984.

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MAIDSTONE R.D.C. (1) 16 houses. (2) Bearsted. (3) R. Lawrence & Son. (4) £25,985.

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MAIDSTONE R.D.C. (1) 16 houses. (2) Bearsted. (3) W. H. Bensted & Son Ltd. (4) £26,395 5s. 9d.

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MAIDSTONE R.D.C. (1) 16 houses. (2) Bearsted. (3) R. Corben & Son Ltd. (4) £27,589.

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MAIDSTONE R.D.C. (1) 12 houses. (2) Coxheath. (3) E. J. Penn Ltd. (4) £15,790 16s. 10d. Accepted subject to Min. approval.

* * *

MAIDSTONE R.D.C. (1) 12 houses. (2) Coxheath. (3) R. Lawrence & Sons. (4) £15,995.

* * *

NEWCASTLE-ON-TYNE C.C. (1) 34 three-bedroomed houses. (2) Kenton. (3) J. H. Fisher & Co. Ltd., Kenton Lane, Newcastle-on-Tyne.

* * *

TOW LAW (CO. DURHAM) U.D.C. (1) 12 aged people's houses. (3) Thomas Armstrong Ltd., Robson Street, Shields Road, Newcastle-on-Tyne. Architects: J. Walter Hanson & Son, 123 Northumberland Street, Newcastle-on-Tyne.

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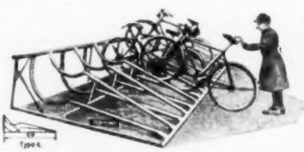

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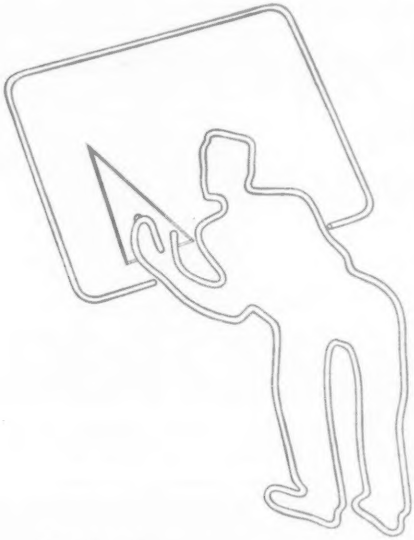

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Forms of application may be obtained from the Director of Housing, The County Hall, Westminster Bridge, S.E.1 (stamped addressed envelope required and quote reference A.A.1). Canvassing disqualifies. (816). [0101

LONDON COUNTY COUNCIL.

ARCHITECT'S DEPARTMENT.

APPLICATIONS are invited for positions of ARCHITECT, Grade III (£550-£700) and TECHNICAL ASSISTANT (up to £580) for work on new housing schools and other public buildings. The positions are superannuable. Candidates for Grade III positions should possess professional qualifications.—Application forms from the Architect (AR/P/S), The County Hall, Westminster Bridge, S.E.1, enclosing stamped addressed foolscap envelope. Canvassing disqualifies. (384). [0097

AIR MINISTRY have vacancies for DESIGNER/DRAUGHTSMEN in the Designs Branch of the Works Department in the following fields: Architecture, Drainage and Water Supply, Land Survey. Vacancies are mainly in London but there are some in the provinces. If desired, consideration would be given to making appointments for London only. Salaries are on ranges up to £625 with starting pay in accordance with age and qualifications.—Applications, stating age, qualifications, previous appointments (with dates), should be sent to Air Ministry (S.2.H), Cornwall House, London, S.E.1, from which address further details may also be obtained. [5275

MINISTRY OF WORKS.

THERE are vacancies in the Chief Architect's Division for ARCHITECTURAL ASSISTANTS and LEADING ARCHITECTURAL ASSISTANTS with recognised training and fair experience. Successful candidates will be employed in London and elsewhere on a wide variety of Public Buildings, including Atomic Energy and other Research Establishments, Telephone Exchanges and Housing.

Salary: Architectural Assistants £300-£525 per annum; Leading Architectural Assistants £500-£625 per annum. Starting pay will be assessed according to age, qualifications and experience. These rates are for London; a small deduction is made in the Provinces.

Although these are not established posts, some of them have long term possibilities and competitions are held periodically to fill established vacancies.

Apply in writing, stating age, nationality, full details of experience and locality preferred, to Chief Architect, Ministry of Works, Abell House, John Islip Street, London, S.W.1, quoting reference WG10/BC. [5326

CARDIGANSHIRE COUNTY PLANNING COMMITTEE.

APPOINTMENT OF PLANNING ASSISTANT.

APPLICATIONS are invited for the post of **PLANNING ASSISTANT** in the County Planning Department at a salary in accordance with A.P.T. Grade V (£520-£570).

Applicants should have passed at least the Intermediate Examination of the Town Planning Institute, should be experienced in the preparation of Development Plans and Planning Surveys and experience in the supervision of staff is essential. The appointment will be subject to:—

i. National Joint Council Conditions of Service.
ii. The provision of the Local Government Superannuation Act, 1937.
iii. The passing of a satisfactory medical examination.
iv. One month's notice in writing on either side.

Applications should give particulars of age, education, technical training, qualifications, experience, present salary, present and previous appointments, which together with the names of two referees must reach the undersigned not later than noon on Saturday, 7th April, 1951.

J. E. R. CARSON,
Clerk of the County Council.
Cambrian Chambers, Aberystwyth.
22nd March, 1951. [5333

BOROUGH OF SUTTON AND CHEAM.

(a) APPOINTMENT OF ARCHITECTURAL ASSISTANT

(b) APPOINTMENT OF CLERK OF WORKS

APPLICATIONS are invited for the following appointments on the staff of the Borough Engineer and Surveyor:—

(a) **ARCHITECTURAL ASSISTANT**, Grade VI of the A.P.T. Division of the National Scale of Salaries (£595 per annum rising to £660 per annum) plus "London Weighting" of £30 per annum.

Applicants should be suitably qualified with good general experience in housing and public buildings.

The appointment, which is terminable by one month's notice in writing on either side, is on the permanent staff of the Corporation and is subject to the provisions of the Local Government Superannuation Act, 1937. The successful candidate will be required to pass a medical examination.

(b) **CLERK OF WORKS** (£10 to £12 per week).

Applicants should have a sound knowledge of building construction and be experienced in the supervision of housing contracts.

The appointment will be on the temporary staff and the salary will be within the range stated, according to qualifications and experience.

Forms of application may be obtained from Mr. N. H. Michell, A.M.I.C.E., M.I.Mun.E., Borough Engineer and Surveyor, to whom they should be returned not later than Tuesday, 17th April, 1951, endorsed "Architectural Assistant" or "Clerk of Works."

Canvassing, directly or indirectly, will be a disqualification.

A. PRIESTLEY, Town Clerk.
Municipal Offices, Sutton, Surrey.
March, 1951. [5327

BOROUGH OF GILLINGHAM.

BOROUGH ENGINEER AND SURVEYOR'S DEPARTMENT.

APPOINTMENT OF CHIEF ASSISTANT ARCHITECT.

APPLICATIONS are invited for the above-mentioned appointment at a salary in accordance with Grade VII (Consolidated £635-£710) on the A.P. & T. Division of the National Scale of Salaries.

Applicants must be Associates of the Royal Institute of British Architects with, apart from theoretical training, at least 8 years' practical experience covering housing (including multi-storey flats), schools and minor Public Buildings. Preference will be given where the applicant has good administrative experience.

A house will be made available on rent to the successful applicant.

Forms of application and further particulars may be obtained from the Borough Engineer and Surveyor, Municipal Buildings, Gillingham, Kent.

Applications, appropriately endorsed, must be received by the undersigned, accompanied by copies of not more than three recent testimonials, not later than the 10th April, 1951.

Canvassing, directly or indirectly, will disqualify.

J. C. NELSON, Town Clerk.
Municipal Buildings, Gillingham, Kent.
20th March, 1951. [5328

THE RURAL DISTRICT COUNCIL OF GODSTONE.

ARCHITECTURAL ASSISTANT.

APPLICATIONS are invited for the appointment of an ARCHITECTURAL ASSISTANT in the office of the Engineer and Surveyor.

Salary A.P.T. Grade III (£450-£15-£495). Travelling allowance according to the National Scale.

Applications, stating age, qualifications and experience, together with copies of not more than two testimonials, should be delivered to the undersigned as early as possible.

F. W. WALPOLE, Clerk.
Council Offices, Oxted, Surrey.
19th March, 1951. [5323

LONDON ELECTRICITY BOARD.

APPLICATIONS are invited for the following appointments in the Architect's Section of the Chief Engineer's Department in Central London.

(a) ARCHITECTURAL ASSISTANTS. Commencing salary will be from £500 per annum, dependent upon qualifications and experience.

Applicants should be studying for or have passed the Intermediate Examination of the R.I.B.A., be capable draughtsmen and have had several years' experience in an architect's office.

(b) DRAUGHTSMEN. Commencing salary will be from £350 per annum, dependent upon ability and experience.

Applicants should be neat draughtsmen and preferably have had several years' experience in an architect's office.

Salaries for the above posts are provisional pending grading of the posts under the National Agreement of the appropriate negotiating body.

Application forms obtainable from Establishments Officer, 46 New Broad Street, E.C.2, on receipt of an addressed foolscap envelope, to be returned duly completed within 7 days. Please quote ref. EST/V/1148/AA on envelope and all correspondence. [5329

GOVERNMENT OF NORTHERN IRELAND.

MINISTRY OF FINANCE.

ASSISTANT ARCHITECT (SCHOOLS ADVISORY).

APPLICATIONS are invited for an unestablished appointment as ASSISTANT ARCHITECT in the Schools Advisory Section of the Directorate of Works, Ministry of Finance.

The duties of the successful candidate will be, inter alia, to assist in the examination and reporting on plans for all types of school buildings and community centres submitted to the Ministry of Education for approval.

Remuneration will be according to qualifications and experience within the salary range £500-£750 per annum.

Qualifications: Candidates must be registered Architects by examination and have had experience in schools design, preferably in the Architect's Department of an Education Authority.

Preference will be given to candidates who have served in H.M. Forces in war-time provided that such candidates can, or within a reasonable time will be able to, discharge the duties efficiently.

Applications, giving date of birth and full details of qualifications and experience, should be sent to the Director of Establishments, Ministry of Finance, Stormont, so as to reach him not later than the 10th April, 1951. [5330

COUNTY BOROUGH OF CROYDON.

SCHOOL ARCHITECT'S SECTION.

ASSISTANT ARCHITECT.

APPLICATIONS are invited from suitably qualified persons for this appointment.

Salary Grade A.P.T. V (a)—£550 x £20 - £610 per annum plus London Weighting of £30 per annum at age 26 and over.

Living accommodation is not offered.

Application forms, available from the Chief Education Officer, Education Office, Katharine Street, Croydon, on receipt of stamped addressed envelope, must be returned to him within 14 days of the appearance of this advertisement.

Canvassing will disqualify.

E. TABERNER, Town Clerk.
19th March, 1951. [5332

CONTRACTS

GWYRFAI RURAL DISTRICT COUNCIL.

NANTLLE VALLEY FACTORY.

TENDERS are invited for the erection of NEW STEEL FRAMED FACTORY BUILDINGS at Pen-y-Groes, Caernarvonshire, in accordance with Drawings and Bills of Quantities prepared by the Architects and Quantity Surveyors, Messrs. Richard & Douglas Hall, F/A.R.I.B.A., of Bangor, Caerns. Drawings, Bills of Quantities and Forms of Tender will be supplied on payment of a deposit of £2 2s. 0d., which will be returned on receipt of a bona-fide tender not subsequently withdrawn. It will be a condition of tender that local labour is employed in this work to the greatest possible extent.

Applications must be received by the undersigned by not later than 10th April, 1951, and cheques are to be made payable to the Gwyrfai Rural District Council. Particulars will be despatched on 14th April, 1951.

Tenders are to be delivered in the envelope provided but bearing no other distinctive marking by not later than 30th April, 1951.

The Council does not bind itself to accept the lowest or any tender.

(signed) DAVID M. EVANS.

Clerk of the Council.

Cwellyn, Caernarvon.

19th March, 1951. [5325

ARCHITECTURAL APPOINTMENTS VACANT

WANTED, a fully qualified Architect for a well-known London Architect's Office, with experience in carrying out important works and capable of taking over the organisation of a section of interesting work. Must be a capable designer, able to develop rough sketches. A permanent position is contemplated. Commencing salary one thousand two hundred pounds per annum.—Box 0402, The Architect and Building News. [5313

ARCHITECTS' Co-operative Partnership require an Assistant with experience of administration. Salary according to experience.—Apply in writing to 34 Gordon Square, London, W.C.1. [5331

SITUATIONS VACANT

DRAUGHTSMAN required by a Middle East Oil Company for service overseas. Should have had at least five years' experience in drawing office and should be able to prepare detailed drawings of the following types of work: mechanical, pipe work, electrical transmission, distribution, wiring, etc. Knowledge of drawings for buildings and drainage an advantage. Salary starting £630 p.a. clear plus living allowances. Kit allowance, pension scheme.—Write, giving details and quoting K.1232, to Box "Y.F.," c/o J. W. Vickers & Co. Ltd., 7/8 Great Winchester Street, E.C.2. [5324

FOR SALE

ALL Mouldings, Plain and Embossed, and Embossed Ornaments. Numerous designs. — Dareve's Moulding Mills Ltd., 60 Pownall Road, Dalston, E.8. [0086

NISSEN Type Huts, ex-Government stock, reconditioned and supplied ready for erection. All sizes in 6ft. multiples, 36ft. x 16ft., £71 10s. 0d. and £59 8s. 0d.; 24ft. x 16ft., £50 12s. 0d. and £41 16s. 0d.; 72ft. x 16ft., £134 4s. 0d. and £106 14s. 0d. Delivered U.K. Plasterboard Huts and other buildings. Some 24ft. span Nissens.—Write, call or telephone, Universal Supplies (Belvedere) Ltd., Dept. 32, Crabtree Manorway, Belvedere, Kent. Tel. No. Erith 2948. [0057

STEEL framed, single story, Industrial Buildings for sale, complete with covering. 184ft. x 188ft., 188ft. x 100ft., and 188ft. x 84ft.—Sharman, 5 Victoria Street, S.W.1. Abbey 5731/2. [5036

SERVICES OFFERED

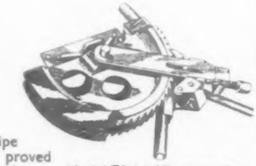
THATCHING and Reedlaying Contracts undertaken by Experts.—J. G. Cowell, Soham, Ely, Cambs. [5120

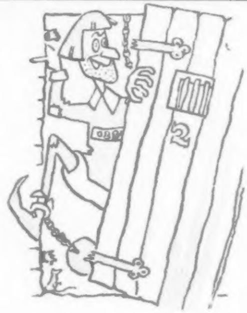
MODELS, Architectural and Industrial.—Inquire first of British Industrial Model Services Ltd., Regent Chambers, Westover Road, Bournemouth. [5305

INSURANCE

ARCHITECTS' Indemnity Insurance effected.—Please write for Proposal Form to

E. J. SAXBY, Incorporated Insurance Broker, 37a Carfax, Horsham, Sussex. Tel. 990. [5233





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